PB-230 038

POLLUTION OF THE INTERSTATE WATERS OF THE UPPER MISSISSIPPI RIVER. CONFERENCE HELD AT ST. PAUL, MINNESOTA ON FEBRUARY 8, 1964. VOLUME I

Public Health Service
Washington, D.C.

1964

DISTRIBUTED BY:

NTIS
National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

Reproduced from best available copy.

CONTENTS

	PAGE:
OPENING STATEMENT BY MR. STEIN	3
STATEMENT OF:	
GOVERNOR JOHN W. REYNOLDS	15
GOVERNOR KARL F. ROLVAAG	20
HON. LESTER JOHNSON	27
H. W. POSTON	32
J. M. RADEMACHER	35
H. C. JORDAHL, JR.	186
HARRY WILSON	233
LT. COLONEL L. B. HARDING	251
ROBERT H. PADDOCK	273
J. J. ABRAMSON	289
LT. COMMANDER JOHN C. PARKER	295
HERBERT A. FLUECK	331
AFTERNOON SESSION	231
RECESS	347

Conference in the Matter of Pollution of the Waters of the Upper Mississippi River and its Significant Tributaries, Minneapolis-St. Paul Metropolitan Area (Minnesota-Wisconsin) on Friday, February 7, 1964, at 9:30 a.m., in the State Capitol Office Building, St. Paul, Minnesota.

PRESIDING:

Mr. Murray Stein, Chief, Enforcement Branch, Water Supply and Pollution Control, Public Health Service, Department of Health, Education, and Welfare, Washington 25, D. C.

CONFEREES:

Dr. M. M. Hargraves, Chairman, Water Pollution Control Commission, State of Minnesota

Lyle H. Smith, Executive Engineer, Water Pollution Control Commission, State of Minnesota

Chester S. Wilson, Special Assistant Attorney General, Counsel for the Water Pollution Control Commission, State of Minnesota

O. J. Muegge, Chairman, Committee on Water Pollution and State Sanitary Engineer, State of Wisconsin

CONFEREES (Continued):

Theodore Wisniewski, Director, State Committee on Water Pollution, State of Wisconsin

James H. McDermott, Assistant Attorney General and Counsel, State Committee on Water Pollution, State of Wisconsin

H. W. Poston, Regional Program Director, Region V, Division of Water Supply and Pollution Control, Department of Health, Education, and Welfare, Chicago, Illinois

PARTICIPANTS:

Hon. John W. Reynolds, Governor of the State of Wisconsin

Hon. Karl F. Rolvaag, Governor of the State of Minnesota

Hon. Lester Johnson, Member of Congress from the State of Wisconsin

J. M. Rademacher, Senior Sanitary Engineer, Region V, Division of Water Supply and Pollution Control, Department of Health, Education, and Welfare, Chicago, Illinois

PARTICIPANTS (Continued):

Harold C. Jordahl, Jr., Regional Coordinator, United States Department of the Interior, States of Michigan, Minnesota, Wisconsin, Iowa and Illinois

Harry Wilson, Division Hydrologist, Mid-Continent Area, United States Geological Survey, St. Louis, Missouri

Lt. Col. L. B. Harding, District Engineer, United States Army, Corps of Engineers

Robert H. Paddock, Division Engineer for Wisconsin, Bureau of Public Roads, U.S. Department of Commerce

John J. Abramson, Civil Engineer, Chicago Regional Office, Federal Power Commission

Lt. Commander John C. Parker, Officer in Charge, Marine Inspection, United States Coast Guard, Dubuque, Iowa

Herbert A. Flueck, State Conservationist, United States Department of Agriculture, Soil Conservation Service, St. Paul, Minnesota

S. Castagna, Engineer, Wisconsin Committee on Water Pollution

Howard Krauss, Member, Advisory Committee to the Wisconsin Department of Resource Development

PARTICIPANTS (Continued):

Martin Hanson, President, Wisconsin Council of Resource Development and Conservation

William Ruth, President, Wisconsin Federation of Conservation Clubs

S. C. Sorensen, Commercial Fisherman, Bay City, Wisconsin

Lloyd V. Spriggle, Bay City, Wisconsin, Member of the Upper Mississippi Pollution Control Committee

Kenneth W. Westerberg, Secretary, Lower Minnesota River Watershed District, Savage, Minnesota

A. W. Buzicky, Director, Metropolitan Mosquito Control District, St. Paul, Minnesota

John F. Tischler, Chairman, Minnesota Water Pollution Control Advisory Committee

Donald J. Thimsen, Minnesota Department of Health, Section on Water Pollution

Tom Tautges, Vice-Chairman, Board of Trustees of the North Suburban Sanitary Sewer District

Eugene V. Avery, Chief Engineer, Department of Public Works, City of St. Paul, Minnesota

PARTICIPANTS (Continued):

Clifford W. Hamblin, General Manager, St. Paul Water Department, St. Paul, Minnesota

Kerwin L. Mick, Chief Engineer and Superintendent, Minneapolis-St. Paul Sanitary District

John P. Badalich, City Engineer, City of South St. Paul, Minnesota

Demetrius G. Jelatis, Mayor of Red Wing, Minnesota

Clarence A. Johannes, Public Health Engineer, Minnesota Department of Health

J. L. Porterfield, American Crystal Sugar Company. Denver, Colorado

Dean K. Johnson, Executive Secretary, Upper Mississippi Waterway Association

Warren Bjorklund, Vice President, Clear Air Clear Water Unlimited. Newport, Minnesota

Arlin Albrecht, Upper Mississippi Pollution Control Committee, Red Wing, Minnesota

George Serbesku, Spring Lake, Minnesota

Mrs. Edith Peller, Excelsior, Minnesota

Harold F. Clark, Bacteriologist in Charge, Water Quality Studies, Division of Water Supply and Pollution Control, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio

OTHERS IN ATTENDANCE:

R. J. Austin, Process Coordinator, American Oil Company, Whiting, Indiana

Mrs. L. F. Johnson, Water Pollution Advisory Committee, Willmar, Minnesota

Charles Whiting, Metropolitan Planning Commission, Editorial Assistant, University and Fairview, St. Paul, Minnesota

Reynold Boezi, Planner II - Social Studies, Metropolitan Planning Commission, St. Paul, Minnesota

Amir H. Sharifa, Planner, Twin Cities Metropolitan Planning Commission, St. Paul, Minnesota

Mrs. William J. Graham, Metropolitan Planning Commission, Bloomington 20, Minnesota

Kenneth A. Carlson, Minnesota Power and Light Company, Duluth, Minnesota

Keith D. Larson, Chemist, Sewage Treatment Plant, South St. Paul, Minnesota

John E. Morris, Natural Resources Committee, Minneapolis, Minnesota

E. P. Nordeen, Upper Mississippi Anti-Pollution Committee, Red Wing, Minnesota

OTHERS IN ATTENDANCE (Continued):

Robert C. Tuveson, Minnesota Water Pollution Control Commission, Albert Lee, Minnesota

James J. Dolglish, Chairman, Twin Cities Metropolitan Planning Commission, St. Paul, Minnesota

Lloyd J. Moosbrugger, Special Assistant Attorney General, Minnesota Water Pollution Control Commission, University of Minnesota Campus, Minneapolis, Minnesota

Duane A. Wilson, Commissioner of Agriculture, Minnesota Water Pollution Control Commission, St. Paul, Minnesota

Luella Reid, Water Pollution Control Commission, Secretary, State Board of Health, Minneapolis, Minnesota

Dr. J. G. Flint, Water Pollution Control Commission, St. Paul, Minnesota

Gordon Slovvt, Reporter, Minneapolis Star, Minneapolis, Minnesota

Robert J. R. Johnson, Reporter, St. Paul Dispatch, St. Paul, Minnesota

Robert Ylvisaker, Reporter, Minneapolis Tribune, Minneapolis, Minnesota

OTHERS IN ATTENDANCE (Continued):

Betty Wilson, Press, Rosemount, Minnesota

Robert Brown, Deputy Commissioner, Minnesota Conservation Department, St. Paul, Minnesota

Sidney A. Freilsen, Director, Minnesota Conservation Department, Division of Waters, St. Paul, Minnesota

Walter Schnitzler, St. Croix County Alliance of Conservation Clubs, Emerald, Wisconsin

R. J. Owens, Chief Engineer, Department of Conservation, St. Paul, Minnesota

Robert C. Nord, Coordinator, Upper Mississippi River Conservation Commission, La Crosse, Wisconsin

John B. Moyle, Superintendent, Section on Research and Planning, Minnesota Conservation Department, St. Paul, Minnesota

Edwin W. Goplen, State Soil Conservation Committee, Zumbrota, Minnesota

Elinor B. Bowes, Field Trip Chairman, St. Paul Audubon Society, St. Paul, Minnesota

Paul L. Hooper, Assistant Superintendent, Bureau of Sport Fisheries and Wildlife, Minneapolis, Minnesota

Bernard R. Jones, Superintendent of Biological Services, Division of Game and Fish, St. Paul, Minnesota

OTHERS IN ATTENDANCE (Continued):

John A. Brown, Citizens Advisory Committee on Outdoor Recreation, St. Paul, Minnesota

Ron Stone, Outboard Boating Club of America, Government Relations Department, Chicago, Illinois

Mrs. W. H. Ruth, Wisconsin Federal Conservation Club, Eagle River, Wisconsin

Olin L. Kaupanger, Secretary, Minnesota Emergency Conservation Commission, Minneapolis 2, Minnesota

John Skrypek, Aquatic Biologist, Minnesota Conservation Department, Lake City, Minnesota

Stanley A. Daley, Aquatic Biologist, Minnesota Conservation Department, St. Paul, Minnesota

Robert G. Wissink, Manager, Radiological Physics Department, Rural Cooperative Power Association, Elk River, Minnesota

A. R. Renquist, Attorney, Northern States Power Company, Minneapolis 2, Minnesota

K. B. Knox, Plant Manager, St. Paul Ammonia Products, Inc., South St. Paul, Minnesota

H. D. Goodwin, Assistant Vice President, Chicago Great Western Railway Company, Kansas City, Missouri

Reproduced from best available copy.

OTHERS IN ATTENDANCE (Continued):

W. E. Jones, General Manager, Northwest Cooperative Mills, St. Paul, Minnesota

Robert G. Arend, Assistant to Vice President, Northwestern Refining Company, St. Paul Park, Minnesota

Jack C. Swan, Refinery Manager, Northwestern Refining Company, St. Paul Park, Minnesota

F. K. Bieri, Assistant Factory Manager, Pittsburgh Plate Glass Company, Red Wing, Minnesota

Fred Reinfeld, Supervisor, Grey Cloud Island, St. Paul Park, Minnesota

George R. Watson, Vice President, Western Oil and Fuel Company, Minneapolis, Minnesota

Paul Strain, International Refineries, Inc., Wrenshall, Minnesota

Earl H. Ruble, Chief Engineer, Earl H. Ruble and Associates, Duluth, Minnesota

Zane B. Mann, Ehlers-Mann and Associates, Minneapolis, Minnesota

F. H. Googins, Production Manager, J. L. Shiely Company, 1101 No. Snelling Avenue, St. Paul, Minnesota

Scott E. Linsley, St. Paul, Minnesota

OTHERS IN ATTENDANCE (Continued):

George N. Walker, Vice President, Honeymead Products Company, Mankato, Minnesota

Thomas J. Campbell, Counsel, Great Northern Oil Company, South St. Paul, Minnesota

Y. J. Lee, Research Engineer, Cargill, Inc., Minneapolis, Minnesota

U. W. Hella, Director, State Parks, St. Paul, Minnesota

John W. Lambert, President, Twin City Barge and Towing Company, St. Paul, Minnesota

Ralph F. Schommer, Secretary-Treasurer, Trimbelle Rod and Gun Club, Prescott, Wisconsin

R. J. Austin, American Oil Company, Whiting, Indiana

James A. Rowe, Chemist, South St. Paul, Minnesota

Connie Burchett, State Representative, 51st District, Anoka County, Coon Rapids, Minnesota

Charles L. Betzel, Mayor, City of Prescott, Prescott, Wisconsin

Howard I. Nelson, Senator, Minnesota Legislature, Lindstrom, Minnesota

OTHERS IN ATTENDANCE (Continued):

Bill Kirchner, State Legislature Representative, 32nd District, Richfield 23, Minnesota

Senator Clarence G. Raugley, State Senate, Red Wing, Minnesota

J. A. Storry, Plant Engineer Manager, Armour and Company, South St. Paul, Minnesota

H. F. Horning, Executive Secretary, N. W. Petroleum Association, Minneapolis, Minnesota

Harvey Norby, Manager, Petroleum Equipment Department, Farmers Union Central Exchange, South St. Paul, Minnesota

R. T. Thornburg, Executive Secretary, Minnesota Petroleum Council, Minneapolis, Minnesota

D. E. Gilberts, Steam Plant Supervising Engineer, Northern States Power Company, Minneapolis, Minnesota

D. W. Elliott, Banister Engineering Company, St. Paul, Minnesota

D. R. Peterson, Superintendent, American Crystal Sugar Company, Chaska, Minnesota

R. O. Schoen, Chief Chemist, American Crystal Sugar Company, Chaska, Minnesota

OTHERS IN ATTENDANCE (Continued):

D. J. Kennedy, Attorney, League of Minnesota Municipalities, University of Minnesota

E. A. Westman, Civil Engineer, Water Department, City of Minneapolis, Minneapolis, Minnesota

R. J. Hendershall, Engineer, Minnesota Association of Consulting Engineers, Hopkins, Minnesota

Edward J. H. Smith, Acting President, Mississippi Gorge Association, Minneapolis, Minnesota

E. J. Doyle, President, Clear Air Clear Water Guild, South St. Paul, Minnesota

Ralph B. Scott, Assistant Vice President, Northwestern National Bank, Minneapolis, Minnesota

Joseph H. Strub, Jr., Weather Bureau Office, Minneapolis, Minnesota

Clyde Ryberg, Executive Secretary, Minnesota River Drainage Development, Minneapolis, Minnesota

Jack McCauley, Director, Government Relations, St. Paul Chamber of Commerce, St. Paul, Minnesota

W. C. Krog, Jr., Manager, Urban Development Department, Minneapolis Chamber of Commerce, Minneapolis, Minnesota

OTHERS IN ATTENDANCE (Continued):

Henry M. Smith, President, North Central Marine Association, Minneapolis, Minnesota

Orlando R. Ruschmeyer, Resident Fellow, University of Minnesota, St. Paul, Minnesota

Raymond A. Haik, Attorney, Lower Minnesota River Watershed District, Minneapolis, Minnesota

Eugene A. Hickok, P.E., Consulting Hydrologist, Professional Building, Excelsior, Minnesota

Martin Leakse, Associate Professor, Wisconsin State College, River Falls, Wisconsin

Ralph Most, Sr., Prescott, Wisconsin

Shirley Brattlof, St. Paul, Minnesota

Charles Kiester, Minneapolis, Minnesota

R. A. Smith, Engineer, St. Paul, Minnesota

Mrs. Bertan Germain, St. Paul, Minnesota

Marilyn Korneski, Hastings, Minnesota

Michael Korneski, Hastings, Minnesota

Dr. C. D. McNabb, Associate Professor of Biology, St. Mary's College, Winona, Minnesota

Dr. Calvin R. Fremling, Associate Professor, Winona State College, Gilmore Valley, Winona, Minnesota

OTHERS IN ATTENDANCE (Continued):

Kenneth Hokanson, University of Minnesota, Minneapolis, Minnesota

John Koeper, St. Paul, Minnesota

E. I. Anderson, St. Paul, Minnesota

Floyd S. Cartwright, Shevlin, Minnesota

Walfred J. Arkola, Mechanical Engineer, St. Paul, Minnesota

H. M. Harren, Chairman, Civil Administration, State of Minnesota, Albany, Minnesota

John D. Floyd, Project Representative, U.S. AEC, Chicago, Elk River, Minnesota

James W. Geurin, Branch Area Chief, U.S. Geological Survey, Bridgetown, Missouri

Donald M. Gardiner, Director, Health and Safety, USAEC, Argonne, Illinois

Richmond F. Brown, District Geologist, U. S. Geological Survey, St. Paul, Minnesota

David B. Anderson, District Engineer, U. S. Geological Survey, St. Paul, Minnesota

J. Wesley Walters, U. S. Army Corps of Engineers, St. Paul, Minnesota

Paul H. Eschmeyer, Assistant Laboratory Director, U.S. Bureau of Commercial Fisheries, Ann Arbor, Michigan

OTHERS IN ATTENDANCE (Continued):

Philip L. McLaughlin, Sanitary Engineer, 9th Naval District, Public Works Office, Great Lakes, Illinois

Wayne R. Nicolls, Forester-Watershed Manager, U. S. Forest Service, Duluth, Minnesota

O. M. Bishop, Area Director, Area III, U.S. Bureau of Mines, Minneapolis, Minnesota

Lawrence A. Schmid, Assistant Sanitary Engineer, U.S. Public Health Service, Region VI, Kansas City, Missouri

Hayse H. Black, Waste Consultant, U.S. Public Health Service, Cincinnati, Ohio

Harold F. Cleary, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio

Rheta B. Piere, Conference Coordinator, Public Health Service, Division of Water Supply and Pollution Control, Washington 25, D. C.

K. E. Biglane, Technical Services Branch, Division of Water Supply and Pollution Control, Public Health Service, Washington 25, D. C.

F. K. Erickson, Associate Regional Health Director, Public Health Service, Region VI, Kansas City, Missouri

Don Townley, U. S. Public Health Service, Region VI, Kansas City, Missouri

OTHERS IN ATTENDANCE (Continued):

F. W. Kittrell, Chief, Pollution Evaluation, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio

Mrs. Lloyd Woodruff, Chairman, National League of Women Voters (St. Paul), St. Paul, Minnesota

Mrs. Eva Stoll, Chairman of Unit 34, League of Women Voters, Minneapolis, Minnesota

Mrs. Terry W. Fuller, Board of Directors, League of Women Voters, Red Wing, Minnesota

Mrs. Robert L. Moore, Board of Directors, League of Women Voters, Red Wing, Minnesota

Mrs. G. E. Mann, League of Women Voters, State Board, Fergus Falls, Minnesota

Mrs. Malcolm Hargraves, Rochester League of Women Voters, Rochester, Minnesota

Mrs. Harold Mooney, Minneapolis League of Women Voters, Minneapolis, Minnesota

Mrs. Wm. Whiting, President, League of Women Voters, Owatonna, Minnesota

Mrs. Gregory E. Fox, League of Women Voters, Roseville, St. Paul, Minnesota

Mrs. Ernest Rinke, League of Women Voters, National Agenda Clerk, St. Paul, Minnesota

OTHERS IN ATTENDANCE (Continued):

Mrs. Neal R. Amundson, Falega Heights League of Women Voters, Bulletin-Editor, St. Paul, Minnesota

Mrs. James Earl, President, St. Paul League of Women Voters, St. Paul, Minnesota

Mrs. Ray Grove, National Level, League of Women Voters, St. Paul, Minnesota

Mrs. H. Milton Reeves, Aberdeen, South Dakota

Mrs. Herbert Bond, President, St. Croix Valley League of Women Voters, Sweetwater, Minnesota

F. L. Woodward, State Sanitary Engineer, Minnesota Department of Health, Minneapolis, Minnesota

Wesley E. Smith, Biologist, Minnesota State Health Department, Minneapolis, Minnesota

Louis J. Breimhurst, Assistant Public Health Engineer, Minnesota Health Department, University Of Minnesota Campus, Minneapolis, Minnesota

Mrs. Carl Dreres, State Board of Health, St. Paul, Minnesota

Larry Breimhurst, Engineer, Minnesota Department of Health, St. Paul, Minnesota

OTHERS IN ATTENDANCE (Continued):

Al Olson, Health Educator, Minnesota Department of Health, University of Minnesota Campus, Minneapolis, Minnesota

P. J. Houser, Director, Engineering Division, Iowa State Department of Health, State Office Building, Des Moines, Iowa

William P. Poblete, Public Health Engineer, Rochester, Minnesota

L. E. Richie, Geologist, Minnesota Department of Health, Minneapolis, Minnesota

W. D. Schoell, Consulting Engineer, Village of Minnetonka, Hopkins, Minnesota

George L. Williams, Treatment Plant Operator, City of Red Wing, Red Wing, Minnesota

Edward C. Schwartz, Administrative Assistant, Anoka County, Court House, Anoka, Minnesota

Robert Nixon, Columbia Heights, Minneapolis, Minnesota

Eugene A. Greicar, President, City Council, Shakopee, Minnesota

James Taylor Dunn, President, St. Croix River Association, Minnesota Historical Society, St. Paul, Minnesota

OTHERS IN ATTENDANCE (Continued):

Arvid M. Falk, Assistant City Attorney, City of Minneapolis, Minneapolis, Minnesota

Wayne H. Dannheim, Administrator, Village of Circle Pines, Circle Pines, Minnesota

Earl H. Foster, Pierce County Committee, River Falls, Wisconsin

Gordon E. Bodien, City Engineer, City of Minneapolis, Minneapolis 15, Minnesota

Joseph C. Kittilson, Alderman, City of Prescott, Prescott, Wisconsin

Isabel St. John, State Secretary, Izaak Walton League of America, Minneapolis, Minnesota

Jake N. Licke, State President, State Division, Izaak Walton League of America, Walker, Minnesota

James J. Sullivan, South Minneapolis Chapter, Izaak Walton League of America, Minneapolis, Minnesota

Leo D. Mosier, Senator, State Senate, Minneapolis, Minnesota

Richard L. Sha, Engineering Consultant, NSSSD, Minneapolis, Minnesota

W. H. Cropsey, Superintendent, Sewage Treatment Plant, City of South St. Paul, South St. Paul, Minnesota

OTHERS IN ATTENDANCE (Continued):

L. W. Marsh, Executive Secretary, Minneapolis-St. Paul Sanitary District, St. Paul, Minnesota

M. L. Robins, Chief Chemical and Sanitary Engineer, Minneapolis-St. Paul Sanitary District, St. Paul, Minnesota

Mrs. J. Homer Pierson, Secretary, Clear Air-Clear Water Unlimited, South St. Paul, Minnesota

M. R. Boudrye, Director, Clear Air-Clear Water, Unlimited, South St. Paul, Minnesota

Thomas C. Savage, Clear Air-Clear Water Unlimited, South St. Paul, Minnesota

Keith D. Law, Hastings, Minnesota

Elizabeth J. Anderson, Treasurer, Clear Air-Clear Water Unlimited, St. Paul, Minnesota

Willis Olson, Hastings, Minnesota

M. R. Boudry, 3100 38th Avenue, So., Minneapolis, Minnesota

C. G. Brown, Brooklyn Park, Minnesota

Edward D. Shimeh, Brooklyn Park, Minnesota

Raymond A. Haik, Minneapolis, Minnesota

PROCEEDINGS

OPENING STATEMENT
BY
MR. MURRAY STEIN

MR. STEIN: The conference is open.

This conference in the matter of pollution of the interstate and intrastate waters of the Mississippi River and its tributaries involving the States of Wisconsin and Minnesota and the Department of Health, Education, and Welfare, is being held under the provisions of Section 8 of the Federal Water Pollution Control Act. Under the terms of the Act the Secretary of Health, Education, and Welfare is authorized to call a conference of this type when requested to do so by the Governor of a State and when on the basis of reports, surveys or studies he has reason to believe that pollution of interstate waters subject to abatement under the Act is occurring.

In a letter dated September 9, 1963, to the Honorable Anthony Celebrezze, Secretary of Health, Education, and Welfare, Governor Karl Rolvaag of Minnesota made such a request, as did Governor John Reynolds of Wisconsin in a letter dated September 17, 1963.

Both of these letters, without objection, will appear in the record at this point.

(The letters referred to are as follows:

THE STATE OF WISCONSIN
EXECUTIVE OFFICE
MADISON
53702

John W. Reynolds
Governor

September 17, 1963

The Honorable Anthony J. Celebrezze, Secretary
Department of Health, Education and Welfare
Washington 25, D. C.

Dear Secretary Celebrezze:

I would like to express my sincere appreciation and that of Governor Karl Rolvaag of Minnesota for your assistance in making available to us the time and services of members of your staff for a meeting held here on September 6 in connection with the problem of water pollution control along the Mississippi River.

I would like at this time to join Governor

Rolvaag in requesting a conference under the provisions of Section 8 of the Federal Water Pollution Control Act.

The subject of such conference should be the interstate and intrastate pollution problems of the Mississippi River from the Coon Rapids Dam in Minnesota, through Lake Pepin, including the major tributaries in Minnesota and Wisconsin.

We appreciate the support and cooperation offered by Assistant Secretary James Quigley and Mr. Murray Stein of your Department, and of Assistant Secretary Briggs of the Department of the Interior. We agree with them that an extensive study of the pollution problems will be necessary in order to alleviate the dangerous situations that exist.

Both Governor Rolvaag and I have, as you know, expressed our determination that all appropriate state agencies shall cooperate fully with the Federal Government in determining the extent of the problem, the avenues of approach to, and the solution and execution of the agreed upon methods of control.

We look forward to working with you in full cooperation, and appreciate your help thus far.

Sincerely yours,

/s/ John W. Reynolds, Governor

* * * * * *

STATE OF MINNESOTA
EXECUTIVE OFFICE
SAINT PAUL 1

Karl F. Rolvaag
Governor

Honorable Anthony Celebrezze
Secretary
Department Health, Education and Welfare
Washington 25, D. C.

Dear Secretary Celebrezze:

May I express to you the sincere thanks of Governor John Reynolds of Wisconsin and myself for your kindness in making Assistant Secretary James Quigley and Mr. Murray Stein of your department available for our September 6th meeting.

After conference with Assistant Secretary Quigley, Mr. Murray Stein, Asst. Secretary of Interior, Mr Frank P. Briggs and Representatives of the U. S. Army Corps of Engineers, Governor Reynolds and I would like to request a conference under the provisions of Section 8 of the Federal Water Pollution Control Act.

Such action would include the interstate and intrastate pollution problems of the Mississippi River from the Coon Rapids Dam in Minnesota through Lake Pepin including the major tributaries in Minnesota and Wisconsin.

Both federal and state officials concerned are agreed that an extensive study of the pollution problems will be necessary in order to achieve equitable solutions. We especially appreciate the support and cooperation offered by Assistant Secretary Quigley and Assistant Secretary Briggs.

We are certain that with federal cooperation in partnership with our respective state organizations much can be done to improve our water resources in Minnesota and Wisconsin. It will prove to be of inestimable value to this entire region and the nation.

Your thoughtful understanding and cooperation thus far has been deeply appreciated and we look forward to the privilege of working with you to meet the challenge ahead.

Sincerely,

/s/ Karl F. Rolvaag, Governor

cc: Mr. Quigley

Mr. Stein

Mr. Briggs

Governor Reynolds

Lt. Col. Harding)

****

Reproduced from best available copy.

Opening Statement - Mr. Stein

MR. STEIN: In accordance with these requests and with the terms of the law, a notice of the conference was sent to Dr. Barr, Secretary, Minnesota Water Pollution Control Commission and to Mr. Wisniewski, Director, Wisconsin State Committee on Water Pollution.

I might say in response to the request from these two governors, the Department of Health, Education, and Welfare has recognized that the problem in the Upper Mississippi area around the St. Paul-Minneapolis metropolitan area and the area encompassed by this conference probably constitutes one of the most important resources of this country. The Department believes that this resource is so important that, on the basis of the requests of the two governors, the highest priority has been accorded to it in our Federal agency.

That is, within the limits of appropriated funds and available personnel, you can be sure that this will receive from our Department, in accordance with the law, all that we can put into the problem.

In accordance with the terms of the Act this is a conference between the representatives of the Department of Health, Education, and Welfare and the representatives of the State agencies. These parties constitute the conferees. However, the representatives of the official agencies are privileged to bring whomever they wish to the conference and have them participate in it.

In addition to those two excellent friends of water resources and natural resources, Governor Karl Rolvaag of Minnesota and Governor John W. Reynolds of Wisconsin, we have several conferees, as are required by law.

The State of Minnesota has designated as its conferees for the conference Dr. M. M. Hargraves, Chairman, Water Pollution Control Commission; Lyle H. Smith, Executive Engineer for the Commission; Chester S. Wilson, Special Assistant Attorney General, Counsel for the Commission. Conferees for the State of Wisconsin are O. J. Muegge, Chairman, Committee on Water Pollution and State Sanitary Engineer; Mr. Theodore Wisniewski, Director, Committee on Water Pollution; and Mr. James H. McDermott, Assistant Attorney General and Counsel to the Committee on Water Pollution. Mr. H. W. Poston has been designated as conferee for the Department of Health, Education, and Welfare. My name is Murray Stein, and I am from headquarters of the Department of Health, Education, and Welfare, in Washington, D. C.

As you know, the conference procedure is a tried and proven technique. In many of the States conferences are used informally in the day-to-day business of water pollution control. And as long ago as 1921 the value of this technique was recognized by the United States Supreme Court when in the famous case of New York against New Jersey involving interstate pollution, it stated, and I quote:

> "We cannot withhold the suggestion inspired by the consideration of this case, that the grave problems of sewage disposal presented by the large and growing population living on the shores of New York Bay is one more likely to be wisely solved by cooperative study and by conference and mutual concession on the part of representatives of the States so vitally interested in it than by proceedings in any court, however constituted."

We strongly support the conference technique, and we in the Federal program measure our success by the situations which are solved at the conference stage rather than by the court actions we bring.

It would seem that the complex problem in this area is one particularly amenable to equitable solution by the conference technique.

Both the States and the Federal Government have responsibilities in dealing with water pollution control problems. The Federal Water Pollution Control Act declares that the States have primary rights and responsibilities for taking action to abate and control pollution. Consistent with this, we are charged by law to encourage the States in these activities. However, the Secretary of Health, Education, and Welfare also is charged by law with specific responsibilities in the field of water pollution control, in connection with pollution of navigable and interstate waters which endangers the health or welfare of persons. The Act provides that pollution of interstate waters, whether the matter causing or contributing to such pollution is discharged directly into such waters, or reaches such waters after discharge into a tributary of such waters, which endangers the health or welfare of persons in a State other than that in which the discharge originates, is subject to abatement. In the case of intrastate navigable waters the Act states that the Secretary shall call a conference at the request of the Governor of any State if that request refers to pollution of interstate or navigable waters which is endangering the health or welfare of persons only in the requesting State in which the discharges originate, or if the request refers to pollution of waters which is endangering the health or welfare of persons in the requesting State.

Opening Statement - Mr. Stein

The purpose of this conference is to bring together representatives of the State water pollution control agencies and the Department of Health, Education, and Welfare, the governors of the States, and other interested parties to review the existing situation, the progress which has been made, to lay a basis for future action by all parties concerned and to give the States, localities and industries an opportunity to take any remedial action which may be indicated under State and local law

Under the Federal law the Secretary is required, at the conclusion of the conference, to prepare a summary of it which will be sent to the conferees. The summary, according to law, must include the following:

1. Occurrence of pollution of interstate and navigable waters subject to abatement under the Federal Act;

2. Adequacy of measures taken toward abatement of the pollution; and

3. The nature of delays, if any, being encountered in abating the pollution.

Subsequent to the holding of a conference, the Secretary of Health, Education, and Welfare is required to make recommendations for remedial action if such recommendations are indicated.

In order to help us provide a serviceable summary we suggest the conference discussion be directed towards covering those points outlined above. The conference conclusions and recommendations will be based solely on the material presented in this record. Mr. Al M. Zimmer is making a verbatim report of the conference, so we will have a complete record of what is said and done here. The conference summary and the verbatim report will be made available to the official State water pollution control agencies of Minnesota and Wisconsin. We would suggest that all interested parties who wish a copy of the summary or the transcript, after the conference, get in touch with their State agency.

All the conferees will be called upon to make statements. The conferees, in addition, may call upon participants they have invited to the conference to make statements. At the conclusion of such statements, the conferees will be given an opportunity to comment or ask questions. This procedure has proven effective in the past in developing a clear picture of the problem and in reaching agreements on equitable recommendations and conclusions.

At the end of all the statements, we will have a discussion among the conferees and try to arrive at a basis of agreement on the facts of the situation. Then we will attempt to summarize the conference orally, giving the conferees, of course, the right to amend or suggest modifications of the summary.

We would suggest that persons other than those sitting at the head table called upon to make statements come up to the lectern and speak so that everyone can hear them.

We would like at this point to call upon a great friend of preservation of the country's natural resources, the Governor of Minnesota, Governor Karl F. Rolvaag.

Governor Rolvaag?

GOVERNOR ROLVAAG: I think, Murray, that in the interests of Governor Reynolds' schedule, who's leaving in order to be in Durand, Wisconsin, later this forenoon, I will yield my position as the host governor and permit Governor Reynolds to make his statement.

GOVERNOR REYNOLDS: Thank you, Karl.

STATEMENT OF THE HONORABLE JOHN W. REYNOLDS,
GOVERNOR OF THE STATE OF WISCONSIN

GOVERNOR REYNOLDS: Governor Rolvaag, Mr. Stein, and friends:

It is indeed a pleasure to be here this morning in Minneapolis and St. Paul, and especially to be considering the problem of the pollution of the Mississippi River, which, as we know, is one of the great natural resources, not only of this section of the country, but of the whole Middle West, practically from the Canadian border down to New Orleans.

This conference or pollution on the Upper Mississippi River was called at the direct request of both Governor Rolvaag and myself, to make sure that every assistance possible be given our two States in the clean-up of this great river. Like many such conferences, this one was spurred by a crisis.

A year ago, at this time, ruptures in tanks and lines of soybean and mineral oils storage areas at Mankato and Savage, Minnesota, had already occurred. Then, approximately 3-½ million gallons of oil lay spilled on the ice and snow, immobilized by the severe cold of that winter.

When the warm spring breakup came to the

Minnesota and Mississippi Rivers, this huge spillage became suddenly mobile, seeping and sliding into the swollen rivers and eventually into the Mississippi itself.

The lighter oils moved rather freely, spreading over nearly all of the water surface to Lake Pepin. The more viscous soya oils moved slowly. Lake Pepin held its ice longer than the river, and acted as a dam. Oils backed up into the sloughs and backwaters, some being blown ashore, some sinking, and some bobbing along causing, in the words of one man, "the biggest pollution mess I have ever seen."

It was at this point that Wisconsin became involved in this problem.

On March 29, the Wisconsin Committee on Water Pollution received warning on the situation. By April 3, Governor Rolvaag, who had by that time become governor, had already declared a state of emergency and called out the Minnesota National Guard.

On April 8, Governor Rolvaag contacted me, advising me of the seriousness of the situation and suggesting an early meeting to discuss the emergency. We checked with our officials that day and, on April 9th, dispatched a Department of Resource Development specialist to survey the situation by air.

He found the upper part of Lake Pepin with an

80 percent oil covering with huge blobs of congealed oil shining in the sun. Shorelines were covered with yellow oil. Except for a dilution area at the mouth of the St. Croix River, the Mississippi River had a 100 percent -- I repeat that -- 100 percent -- oil slick up to St. Paul.

On April 12 my representative met with Governor Rolvaag at St. Paul to discuss the situation with concerned State and Federal agency people. At this meeting, the Federal Government reported on their analysis of the situation and explained possible control measures. None of these measures were deemed feasible considering the tremendous area covered by the oils.

On April 19, a ground check was made of the area by the Department of Resource Development.

At this time, it was determined that this problem would be with us for some time. While fish and wildlife losses in Wisconsin were reported as minimal, heavy damage to beaches and shore installations were apparent.

On May 7, a preliminary report on conditions was received from Mr. DeMartini of the Public Health Service, on the April 16-22 check of the area from Mankato, Minnesota, to Alma, Wisconsin. Conditions, by that time, were much improved, but he warned of substantial oil concentrations in bottom muds. These, I notice, were reported later as persisting. Since such oils in bottom muds stop biotic life there and can seriously affect fish life, their presence is critical.

On September 6, at the request of Governor Rolvaag and myself, a meeting was held in Madison at which Mr. Quigley, Assistant Secretary of the United States Department of Health, Education, and Welfare, and Murray Stein, Chief of Enforcement, were present with their staffs to provide our two States with a summary of the investigations to date and Federal recommendations.

After full discussion of both State and Federal technical people, Governor Rolvaag and I officially requested, as Mr. Stein mentioned previously, that the Federal Department of Health, Education, and Welfare, cooperating with concerned State agencies, make a complete check of the Upper Mississippi River Basin to determine and isolate causes of pollution and to recommend remedies.

The past months have been months of intensive action, but I realize that many of the residents along this river are impatient for rapid clean-up, and rightly so.

Governor Rolvaag and I feel that unified action will be needed to make progress. Minnesota, with its Twin Cities Metropolitan area, faces the biggest job as, of course, they have the greatest concentration of industry and population on the upper river. The Federal Government urgently needs regulation of barge traffic dumping, and Wisconsin certainly is not blameless in many respects.

As we use these waters more and more heavily, and as developments increase, we all have to be more considerate. We all must realize that septic tank leaking is pollution -- that commercial fish refuse tossed in the river is pollution -- that facilities for barge-blowing and refuse disposal are needed now. Wisconsin pledges its cooperation with both Minnesota and the Department of Health, Education, and Welfare, for the protection of the great Mississippi resource.

I do hope, and I am sure, that this conference today will be a most fruitful one, that the three agencies of government, the Federal Government and the two States, will join in a united effort to clean up probably one of the greatest natural resources of the world, the Mississippi River.

Thank you.

MR. STEIN: Thank you, Governor.

(Applause.)

MR. STEIN: Thank you for a very excellent and comprehensive statement, Governor.

Governor Rolvaag.

STATEMENT OF THE HONORABLE KARL F. ROLVAAG, GOVERNOR OF THE STATE OF MINNESOTA

GOVERNOR ROLVAAG: Governor Reynolds, Murray Stein, Chief of the Enforcement Division, and all those friends in conservation efforts to combat pollution:

It is a pleasure this morning to extend official greetings to our friend and neighbor, the Honorable John W. Reynolds, Governor of Wisconsin. Also to Mr. Murray Stein, Chief of the Enforcement Branch, Division of Water Supply and Pollution Control, United States Public Health Service; conferees from Wisconsin and Minnesota, and other officials and individuals interested in the present or future use of the Mississippi River and connecting waters. It is my sincere hope, and one which I am sure you all share with me, that today's conference will prove a most successful and productive one. Without question, the need for this is of the greatest urgency, and I am happy to see such substantial and wholehearted support and representation by Federal, State and local agencies, as well as private citizens.

The problem that brings us together today, ironically, was created by official indifferences and public apathy to the problem of water pollution. It took last winter's oil spills on the Mississippi River, and a tragic loss of wildlife and damage to private shore installations, to arouse a sleeping and indifferent public. This incident created a crisis and caused an immediate and intensive investigation into our methods and policing of water pollution control activities. Last fall, Governor Reynolds and I requested President Kennedy to aid us in setting up this conference so that all citizens and agencies involved in pollution control could listen and contribute their knowledge to this most basic of all human needs and human problems, in this section of America.

I believe that this conference will accomplish much, because it must.

We in Minnesota are proud of our conservation education program. We feel that in most areas we have made great strides in developing public understanding and awareness. But it is obvious from recent events that much remains to be done to educate the public to the realities of the pollution problem; to develop better understanding and acceptance of the necessity for the stringent measures needed and required by pollution abatement programs.

The significance of water conservation cannot be overemphasized. We can anticipate that during the next

100 years, Minnesota will experience a greater need, a greater demand for water to be used by its increasing population, expanding industry, and more productive agriculture. Our higher standards of living, too, is daily requiring more water per capita.

Minnesota is unusually fortunate in the abundance and purity of its water resources, and, generally, increased demands will not overtax available supplies But unless we act now, an unavoidable consequence of expansion will be additional possibilities for the pollution of our lakes, our streams, and our underground sources.

I feel that it is important to note here, too, that if our abundant water resources are to be developed without overtaxing supplies in some localities while water is wasted in others, the program of hydrologic studies and data collection now being carried on must be continued and expanded.

The watershed approach to management of water resources should be encouraged and integrated with State policies and objectives by suitable action at the State level. "Pure Water for Tomorrow" is truly one of the most solemn obligations we owe to our sons and daughters.

Improved water management practices and increased public awareness of the importance of water, and the vital necessity for enlightened pollution abatement programs must be dramatized and brought home to every citizen to obtain an effective water management program for the future.

Today, we are well aware of the existence of pollution in the stretch of river immediately below the Twin Cities, and the need for improvement in that locale.

We are not gathered here today to point accusing fingers and directly assess responsibility for the situation with which we are confronted. Whatever the factors involved, the pollution problem has been accentuated by the explosive population growth that has taken place in the Twin Cities and their suburbs over the past 15 years -- one of the fastest growing of all such areas in our nation.

When the Minnesota and Mississippi Rivers were befouled by large quantities of oils escaping from industrial storage tanks last winter, and inflicted heavy damage on ducks and other water fowl moving north in the spring migration, and on fish and other wildlife, countless citizens were astounded to learn that none of our State agencies had clear-cut responsibility and legal authority to enforce measures to insure proper storage of such materials. Nor did they possess the powers to require salvage action and cleanup in such accidental loss.

The water pollution control measures enacted by the 1963 session of the Minnesota legislature, which I signed into law, authorized the Water Pollution Control Commission to adopt regulations to require protection for all tanks where liquids are stored to prevent spills reaching a watercourse. The Commission is now preparing such regulations.

Section 4 of Chapter 874, Minnesota Laws of 1963, establishes a positive State policy regarding prevention and abatement of pollution. The Water Pollution Control Commission is developing a long-range plan and program for implementing this policy. Armed with this legislative mandate and the additional authority, the Commission has every intention of pursuing an aggressive program within the limits of the funds and personnel available to it.

Later today, the Commission will make its own report on the accomplishments, present conditions, policies, goals and objectives, and proposed future actions relating to water pollution control by the State of Minnesota.

It would seem obvious that the long-range program of the Water Pollution Control Commission must be fully evaluated if we are to move ahead and reach our stated objective of the best use and protection of the waters of all of our State.

Any program would be handicapped without comprehensive studies to assure that pollution control is based on adequate scientific knowledge if we are to avoid creating new problems and if we are to correct dreadful past errors and oversights. And, as I mentioned earlier, our new program must be based on the changing water needs of at least the next 50 years.

It was apparent -- early last year -- that our Water Pollution Control Commission did not have the funds nor personnel for such detailed studies. Of necessity we have looked to the Federal Government for assistance and cooperation with both Minnesota and Wisconsin.

The possibility of a broad Federal study was discussed when I visited Washington last June to confer on a number of conservation matters. Then, in September, at a meeting in Madison, Wisconsin, and after a conversation with President Kennedy, Governor Reynolds joined me in a request for a study of water pollution in the Upper Mississippi River and its tributaries, including the Minnesota River. Federal representatives immediately responded with plans for a comprehensive study of approximately two years' duration to be conducted by the Public Health Service, at a minimum cost of $250,000, and possibly half a million dollars.

The Minnesota Water Pollution Control Commission assures me that it welcomes the opportunity to join with the

United States Public Health Service in their study of river conditions in this area.

We expect that the results of this investigation by Federal agencies, as to sources of pollution, methods of treatment, and the effects of effluent on the river will be of great assistance to the Commission in developing its future long-range plans.

Minnesota has played a key role in bi-partisan efforts to obtain adequate water pollution control legislation, since the efforts of the late Senators Barkley and Taft resulted in enactment of the first clean water bill in 1948.

Thanks to the inspired leadership of Congressman John A. Blatnik of Minnesota, whom our late President John F. Kennedy called "the father of the Federal water pollution control program -- the program which is cleaning up rivers and streams throughout America," and also through the efforts of Senator Hubert H. Humphrey, Senator Eugene McCarthy and others in Minnesota, we have seen this basic Act extended and strengthened in 1956, and again in 1961, down to the present proposed effective water pollution control legislation now pending in the Congress of the United States.

I believe the Federal Government has an important role in pollution control. I warmly welcome their technical assistance and I assure Mr. Anthony Celebrezze, Secretary of Health, Education, and Welfare, who agreed to this conference today, of Minnesota's wholehearted cooperation and assistance.

Again, my best wishes for a most successful conference, and my thanks to all those from public and private agencies for their attendance today.

Thank you very much.

(Applause.)

MR. STEIN: Thank you for a truly excellent statement, Governor Rolvaag.

You know, we do have some seats down in front for those who are standing, who may wish to come down and sit, rather than stand in the back.

I might say that even today, Congressman John A. Blatnik is conducting hearings on new water pollution control legislation.

I now have a statement from Congressman Lester Johnson, who has asked that this be put into the record at this time. It is rather short.

He states:

> "I very much regret that Congressional business prevents me from being here in person to take part in this Federal-State Pollution Abatement Conference. However, my friend

"Murray Stein, who is Chief of Enforcement of the Federal Water Pollution Control Program at the Department of Health, Education and Welfare, very kindly offered to extend my greetings and best wishes for the success of this Conference.

"Murray and I became very well-acquainted last spring, when an oil slick on the upper Mississippi River claimed the lives of countless ducks, geese and fur-bearing animals and adversely affected the recreational use of the river for a stretch of 100 miles. I doubt that any of us who worked on this emergency problem will ever forget the lesson it so powerfully illustrated.

"As you know, that oil slick and the havoc it brought has caused the residents on both sides of the Mississippi from Prescott to Prairie du Chien, Wisconsin, to form a Citizens Committee for Upper Mississippi Pollution Control. This Committee, which is serving as a watchdog group, attracted 160 people to its first meeting, held November 2 at Wabasha, Minnesota.

"They came from communities on both sides of the river from the Twin Cities south to the Iowa line. Some of the delegates hailed from towns as far down the river from Wabasha as 90 "miles. They had one thing in common -- a great growing concern over the increasing pollution of the scenic Mississippi River.

"Appropriately enough, the Citizens Committee has chosen as its slogan 'We Can't All Live Upstream.' And just as we can't all live upstream, neither can we continue to pollute and waste our water resources as though we had an inexhaustible supply.

"Although the oil pollution emergency on the Upper Mississippi River created a highly unpleasant situation, it is only part of the ever-increasing industrial waste and sewage pollution of this great waterway. If permitted to continue, this pollution will turn our scenic Upper Mississippi into nothing more than an unattractive and unsanitary open sewer. We must act with all possible speed to put into effect a pollution control program to clean up the Mississippi River and to see that it remains clean.

"I am delighted that the Governors of Wisconsin and Minnesota have requested the Federal assistance that is available under the provisions of the Federal Water Pollution Control Act, which I co-authored with Minnesota Congressman John Blatnik "in the 84th Congress. This Conference is a result of that request.

"The job of establishing and enforcing a long-range pollution abatement program for the Upper Mississippi is a tremendous one. However, it is a job which deserves -- and which I am sure will get -- our best efforts.

"Each year, increasing demands are made of the Upper Mississippi River for commercial navigation and recreational, municipal and industrial uses. It is important that every effort be made to preserve and protect these waters for maximum use for all interests in both States.

"Controlling pollution on the Upper Mississippi River is not merely something that should be done. It is something which must be done. Failure will bring a health hazard and a wasteland in place of a magnificent source of pleasure and a vital flow of revenue.

"Thank you."

This concludes the statement of Lester Johnson, and he followed the rule for germaneness.

Off the record.

(Discussion off the record.)

MR. STEIN: At this point we would like to call on Mr. Poston for the Federal presentation.

GOVERNOR REYNOLDS: Before you start, I must leave.

MR. STEIN: Thank you.

GOVERNOR ROLVAAG: I want to, on behalf of all the conferees and those present here, thank Governor Reynolds for taking time from a very busy schedule to come over here to join with us.

I know that you will accept my apologies for playing host to Governor Reynolds and leaving with him. I will see some of you at lunch this noon.

Thank you very much.

(Applause.)

MR. STEIN: Mr. Poston.

STATEMENT OF H. W. POSTON, CONFEREE AND REGIONAL PROGRAM DIRECTOR, REGION V, DIVISION OF WATER SUPPLY AND POLLUTION CONTROL, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, CHICAGO, ILLINOIS

MR. POSTON: Mr. Chairman, fellow conferees, ladies and gentlemen:

I am very appreciative of the opportunity to be here today as a Federal conferee in this important matter dealing with the water quality of the Upper Mississippi River and some of its tributaries.

The importance, the urgency of this meeting is indicated by the fact that it was called by Governors Rolvaag and Reynolds. Your Congress, by passage of and by appropriations for the Federal Water Pollution Control Act, has shown concern and urgency in pollution matters of the country as a whole.

We are here this morning because of one of these provisions of the Federal Water Pollution Control Act, namely, the enforcement section. There are other provisions in this Act that are presently working in this particular area. Our construction grants program has made available to ten communities in this area $1,200,000 for construction of municipal sewage treatment works, municipal works costing upwards of $5-½ million.

The Federal Government has provisions in the Water Pollution Control Act for grants to State agencies to extend and to expand their State water pollution control programs. There are provisions for research, research on water pollution matters, not only on a contract basis, but on a grant basis to universities, colleges, and from our Sanitary Engineering Center at Cincinnati, Ohio.

The Federal Water Pollution Control Act provides for technical services. These are scientific and technical consultation and assistance in sophisticated matters, matters that are requested by industry and by your State agencies.

Lastly, the Federal Water Pollution Control Act provides for the development of a comprehensive program jointly with State agencies, with Federal agencies, with industries and municipalities which are concerned.

I think I said I was glad to be here. I am glad to be here for several reasons.

First, I am a Midwesterner, and I am working and participating in what I think to be a worthwhile undertaking.

Secondly, I am glad to be here because of the pleasant relationships that we have had with municipalities and your State agencies, and those people in these two States on various parts of our other programs.

Lastly, I am glad to be here because of the friendly, the cooperative and the helpful urgent attitude of all of the people in this State who are concerned with this particular conference.

For the Department of Health, Education, and Welfare, I pledge the support of my staff and my office for clean water in the Mississippi and its tributaries in this particular area; and, as an evidence of our desire to cooperate and be helpful, we have already established at the Twin Cities Naval Air Station an office and a resident technical staff to carry out the directives of this conference.

To outline for you, on the part of the Department of Health, Education, and Welfare, the picture of water use and water pollution problems in this great metropolitan area and the Upper Mississippi River, Mr. Jack Rademacher, Senior Sanitary Engineer of my office, has prepared a report from available information. This will be given to the reporter, and Mr. Rademacher will present a review of the salient points set forth in this report.

Mr. Rademacher.

MR. STEIN: Before you begin, without objection, the report will appear in the record as if read after your summary.

MR. RADEMACHER: Thank you.

STATEMENT OF J. M. RADEMACHER, SENIOR SANITARY ENGINEER, REGION V, DIVISION OF WATER SUPPLY AND POLLUTION CONTROL, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE, CHICAGO, ILLINOIS

MR. RADEMACHER: Mr. Poston, Chairman Stein, distinguished conferees, ladies and gentlemen:

I have submitted to the reporter a full text of the report, and, as Mr. Poston indicated, I will make a review of the salient points of the report.

The purpose of this report, which is based on available data obtained from State and local groups, is to examine and report on the uses made of the area's waters and on the existing sources of pollution.

The cooperation provided by the Minnesota Water Pollution Control Commission and the Wisconsin Committee on Water Pollution should be recognized.

The report considers the quality characteristics of the water as they exist today, and evaluates the effects of waste discharges on water quality and water uses. The report contains conclusions thought to be justified on the basis of information presently available, and suggests areas in which additional investigations are needed.

For the information of all concerned, if you turn to Page 60 in your report that you have here, there is a pull-out map which duplicates the one on the extreme right now.

The conference area, a very important segment of the Upper Mississippi extends from the mouth of the Rum River in Minnesota to the outlet of Lake Pepin. A distance of approximately 107 miles along the main stem of the Mississippi River is covered. The lower reaches of the Minnesota and St. Croix Rivers, which are tributary to the main stem, are also included within the conference area.

The uses of the particular stretch of the Upper Mississippi River described are governed by people and their activities.

On the basis of the 1960 Census, the population of these 12 counties within the study area was over 1,600,000. The Minneapolis-St. Paul Metropolitan Area had a 1960 population of 1,525,000. The downriver areas are sparsely populated in both Wisconsin and Minnesota. However, the picture for this entire area will be drastically changed if the estimates of the demographers and economists are even approximated. They feel that this area will have almost three million people by the year 2000 if present trends continue. All these additional waste producers, with all their supporting commercial and industrial activities, will have available for use the river with no change in volume.

What are these waters used for?

At this time the major use made of the Mississippi River system in this area for municipal water supply is in the upper reach of the river above St. Anthony Falls. The annual average daily withdrawal from the river for Minneapolis and St. Paul is approximately 75 million gallons per day with an estimated maximum daily withdrawal reaching about 200 MGD. About 58% of the people living in the metropolitan area are served by the two supplies.

The metropolitan area is supported by a variety of water-using industries and almost 70% of the water used by industry is ground water. Of the surface water used by industry over 99% is supplied by the Minneapolis and St. Paul municipal systems. Over 126 MGD is used by industry for product processing in the Twin Cities area.

Steam power plants on the Mississippi and Minnesota Rivers in the immediate area of the Twin Cities are the biggest users of water. Almost 868 MGD was the average daily use by the two plants located on the Mississippi River and one plant on the Minnesota River in 1961. The hydro-electric power generation capacity is limited to the upper section of the Mississippi River above its juncture with the Minnesota River. The total hydro-electric generating capacity is only about 4% of the total steam power plant capacity in the area.

Commercial fishing has been a major use of the river and over the years millions of pounds of fish have been harvested by commercial fishermen on the Mississippi. During 1961, for example, the total commercial catch for Pool 4 was 1,736,714 pounds valued at over $81,000. Pool 3, on the other hand, had a total commercial catch of 104,180 pounds valued at about $4,000. Carp is the predominant specie in the commercial catch and amounted to 94.5% of the total in Pool 3 and 93% in Pool 4. There is no commercial fishing in Pool 1. The Minnesota Department of Conservation reports that the average annual commercial catch for the 1959-62 period was 330,955 pounds in Pool 2.

Stock watering and irrigation are relatively minor uses from a volume standpoint with an estimated 116MGY used for irrigation and 2 MGD for stock watering in Minnesota above.

Navigation use can be pictured by the over 5 million tons of cargo that were handled in the Ports of Minneapolis and St. Paul during [illegible]. With the completion of the 9 foot channel above St. Anthony Falls in September 1963 and development of adequate docking facilities, the Corps of Engineers estimates that over 2,000,000 tons of cargo will be locked through the St. Anthony Falls Lock each year.

The species of fish in the stretch of the Mississippi River under consideration range from game to rough. They include walleyed pike, northern pike, largemouth and smallmouth bass, panfish and a great variety of rough fish dominated by carp.

The bulk of the game fish are found in the St. Croix River, in Lake Pepin, in Pool 3 above Red Wing, and in the section about St. Anthony Falls. It is reported by the Minnesota Department of Conservation that on the basis of a 1956 survey, game fish in the Hastings Pool (L.&D. #2) were roughly half as abundant as in the Red Wing Pool (L.&D. #3).

The Mississippi River is also a major artery in the continental system of flyways serving the wildfowl migrations. Each year thousands of ducks, geese, and other migratory birds have made their annual trek to and from the north lands using the Mississippi River as a way station in their travels.

The State of Minnesota has recognized the importance of wildlife preservation in this area and has developed the 5,430 acre Gores - Pool Number 3 Game Refuge and Public Hunting Grounds some six miles southeast of Hastings.

Recreation, considered as an industry, ranks among the top five in both Wisconsin and Minnesota.

Swimming in the waters under consideration is almost totally confined to the St. Croix River and Lake Pepin. On the screen now is a slide showing the relative water uses in the conference area. Lake Pepin has several fine beaches located at Bay City, Wisconsin and Lake City, Minnesota, as well as at the resort areas below Red Wing, Minnesota. These are regularly used by swimmers. The recreational use map indicates the locations of beaches and marinas in the area. Water skiers to a greater or lesser degree use almost the entire stretch of the river to test their skills.

In the Minneapolis-St. Paul marketing area approximately 131,000 outboard motors were in use in 1963. Minneapolis is fifth among the nation's leading cities in outboard motor sales and motors in use. This represents a sizeable boon to the economy of the area, with millions of dollars invested in boats, motors, accessories, insurance, docking, storage, maintenance and repairs.

Fishing is an important recreational activity in the Minneapolis-St. Paul to Lake Pepin area both in summer and winter. Studies on sport fishing conducted in areas similar to the Minneapolis-St. Paul area have shown as many as 75% of all available boats were used for fishing. On that basis, it appears that as many as 100,000 boats may be used for fishing in this area.

During the past year, the total number of persons using licenses was 374,420, or almost 23% of the resident population. Ice fishing is also a popular sport along the river and on a typical winter day several hundred fishing shanties and anglers may be seen on the Mississippi River and Lake Pepin.

The waters of the Upper Mississippi River are also a focal point for parks and recreation areas.

Along the Mississippi River are Hastings Park, Commissary Point Picnic Area, Colville Park, and Bay City Picnic Grounds. Frontenac State Park, located in Goodhue County, Minnesota, is the site of the State's first summer resort. Nearby is the famed Maiden Rock, in Wisconsin, a site that attracts many visitors.

Access to the Mississippi River above Lake Pepin to Prescott, Wisconsin, is somewhat restricted by the railroads which form iron bands binding the river on either side. However, the proposed development of the Great River Road should provide easier access to this entire scenic stretch from Prescott, Wisconsin, through Lake Pepin. An increasing demand for quality water to satisfy the developing recreational uses can be expected.

Waste disposal is also a use.

The Mississippi River in this area receives over a billion gallons of waste water daily including sewage, industrial process water and cooling water.

SOURCES OF WASTES

Where do these wastes come from?

Municipal Wastes

There are 29 municipal sewage treatment plants in the area. Treatment provided ranges from primary to a complete secondary process followed by stabilization ponds. The treatment plants serve an estimated total population of 1,192,000. Of this population, the two major plants - the Minneapolis-St. Paul Sanitary District and South St. Paul - on the Mississippi River serve 89 percent of the total, or 1,061,000. A total of 200 million gallons per day of sewage is discharged to the area's waters by the 29 treatment plants. Of this, approximately 178 MGD or 89.3 percent are discharged from the MSSD and South St. Paul plants.

Federal Installations

Incidentally, there are three Federal installations that reportedly discharge treated wastes to the surface waters of the Twin Cities area. There are many combined sewage overflows in the collecting systems in the Twin Cities area. Over 80 storm water overflow points reported in the Twin Cities area are capable of discharging to the Mississippi River. Some of these sewers discharge pollutional material on a more or less continuous basis while the majority discharge intermittently.

It is difficult to assess the pollutional effects of storm water overflows on receiving waters because there has not been sufficient study of either the characteristics of the overflows or of the effects on receiving waters during periods of overflow to develop factors that may be used in such evaluations.

Industrial Wastes

Seventeen industrial plants discharge process wastes directly to the main stem of the Mississippi River. Principal waste constituents are oils, phenols, ammonia, oxygen demanding materials, and suspended solids. Most of the plants have some type of waste treatment or control but oil spills have occurred as the result of product handling and oil transfer operations from time to time.

Twelve industries discharge wastes to the Minnesota River between Mankato and the Mississippi River. Estimates on flow and specific waste constituents were not available.

Thermal Sources

The principal sources of thermal pollution at the present time in the study area are the Riverside, High Bridge and Black Dog Power Plants of the Northern States Power Company; the Northwestern Refining Co.; St. Paul Ammonia Products, Inc.; Great Northern Oil Co.; Minneapolis-St. Paul Sanitary District Plant; and the South Saint Paul Sewage Treatment Plant.

Within the foreseeable future, the thermal load on the river will be increased with the addition of the proposed Northern States Power Plants at Red Rock and The Prairie Island Plant at Red Wing. An estimate of the magnitude of discharges of wastes from commercial barge and pleasure boat traffic is difficult to assess. The sewage from these craft, combined with other discharges such as bilge pumpages, garbage and litter, presents an increasing problem.

Agriculturally speaking, the waters of the Mississippi River within the area covered by this report are bordered by approximately 200 miles of shore line, much of which is devoted to parks, forests, and improved agricultural lands. Steep bluffs are a predominant feature of this area, condusive to high rates of run-off which may conceivably contain fractions of the more than 55,000 pesticide products currently registered with the Federal Government. In addition, the improved farmlands and lawn areas are potential sources of nutrients contributed to the waters. No data are available as to the extent of these contributions or the effects of the nutrient levels on the river system.

Bulk Storage Areas, Pipelines and Barges

Major oil spills on the Minnesota River in the winter of 1962 were of paramount importance in the recent delegation of authority to the Minnesota Water Pollution Control Commission by the 1963 legislature to prohibit storage without proper safeguards of any liquids which could cause pollution of waters.

While above-ground storage facilities create a potential hazard to nearby water courses, they are by no means the only potential problem. Throughout the country in recent times such disasters as the sinking of barges containing items from chlorine to rye have occurred; oil transfer lines have ruptured during unloading operations; and heating coils within tanks have separated causing damaging substances to be discharged to the watercourse. These are all items which can have far-reaching effects and for which control is difficult. Another problem is the inadequate diking of waste lagoons adjacent to water courses subject to periodic flooding.

Within the area described here, there exist some 33 barge terminals and barge cleaning operations and bulk storage facilities. To this potential must be added the possible hazard generated by the hundreds of tons of gasoline and other petroleum products transported by barges during the year. The Corps of Engineers estimates that possibly 5 percent of the barges in this traffic would develop as "leakers," during the year.

Other Pollution Sources

In addition to the major rivers within the area covered by this report, there are at least 15 small tributary streams contributing to the overall water quality picture. Slight as these sources seem, it must be realized that some of these small watersheds incorporate industrial and urban areas while others accept drainage from cultivated farm lands, small settlements, and individual homesites.

A major consideration of this report is the effects of wastes on water quality and water uses.

J. M. Rademacher

With knowledge of the sources of wastes in the conference area as well as information on such water quality indices as coliform bacteria, bio-chemical oxygen demand, dissolved oxygen, pH, temperature, suspended solids, etc., an assessment may be made of the effects on the existing and potential uses of the waters in the area. The following section outlines these effects insofar as information is available for a reasonable evaluation.

COLIFORM BACTERIA

Minnesota's basic guide for bathing or swimming waters has a limiting value for coliform density although this may vary depending upon the results of a sanitary survey. The upper limit is a "most probable number" of 1,000 coliforms per 100 ml as determined by the arithmetic average of coliform counts during any one month of the recreation season.

According to many State and interstate pollution control agencies, waters used for swimming and water contact sports should not average more than 1,000 MPN/100 ml total coliform bacteria and those used for general recreation should not average more than 5,000 MPN/100 ml.

In this report, coliform concentration data, supplied by the Minneapolis-St. Paul Sanitary District for 1962, were used. The information was reported in terms of coliforms per cubic centimeter, using the presumptive test only. Since most standards for quality with respect to this indice are reported in terms of coliforms per 100 ml, the data was adjusted to this format.

There are various ways to depict the coliform bacteria levels. One way is to look at the chart on the screen. Figure 6 relates the maximum monthly arithmetical average at various stations along the river. This is represented by the shaded areas. The swimming indice of 1,000 coli-100 ml is indicated by the solid black circle in the center of each one of those, and the general recreation indice of 5,000 coli/100 ml by the open circle.

As you can see, these coliform levels for the year 1962 reach 13,000 in the zone above St. Anthony's Falls, climbs to 810,000 at Ft. Snelling Bridge; gets a maximum shot of 43,000 from the Minnesota River and reaches a maximum at Inver Grove Bridge 6 miles below the MSSD and City of South St. Paul with a count of 2,800,000. The "die away" for these coliform or sewage bacteria can be seen in the drop in density all the way down to Lake Pepin opposite Lake City, Minnesota.

The St. Croix River is in good condition on the basis of the coliform levels reported, as is the outlet of Lake Pepin.

In a more dramatic sense, Figure 7 pictures the maximum coliform concentrations in a single drop of water. Anyone ingesting a single drop of water with a coliform density of 1,600,000 coliforms/100 ml as reported at the Ft. Snelling Bridge station would swallow about 800 of these sewage bacteria.

In the interstate section of the river with counts as high as 130,000 coliforms/100 ml at Lock and Dam No. 3, 97,000 coliforms/100 ml at Red Wing and 24,000 at Frontenac, each drop of water sprayed into a boater's mouth or swallowed by a swimmer or water skier would have the possibility of 65, 39, and 12 sewage bacteria being ingested, respectively.

It must be pointed out, however, that these presumptive coliform measurements are total counts and include all types of coliform, including non-fecal varieties.

As a result, any definitive stream survey should include three test procedures: The total coliform test, which has been reported here; the fecal coliform test, as a supplement to the total coliform test, to pinpoint the coliforms that come from soil erosion; and the fecal streptococci test.

BOD - FIVE DAY

The total five-day BOD, bio-chemical oxygen demand, from all sources of sewage is estimated to be approximately 245,430 pounds per day. Of this, 238,190 pounds per day, or 97.1 percent, were discharged directly to the Mississippi River. The MSSD plant accounted for 209,000 pounds per day, or 85.1 percent. The South St. Paul Treatment Plant discharged an estimated 27,000 pounds per day, or 11.0 percent.

A virtual total depletion of dissolved oxygen for a 7.5 mile stretch of the river from below the MSSD outfall to the vicinity of the Great Northern Oil Company barge slip was reported in the 1960-61 survey. Data from the MSSD river sampling program for that period confirmed these conditions.

SUSPENDED SOLIDS AND SLUDGE DEPOSITS

Sludge deposits are common for the entire distance of 21.2 miles from the MSSD plant outfall to the Hastings Dam. These deposits were reported as ranging up to 4.5 feet in depth and varying in consistency from a thick black sticky mass to a sand-sludge mixture. The most active area in terms of sludge decomposition, as would be expected, was in the four miles below the MSSD outfall. These conditions originally surveyed in 1959 generally agreed with conditions found by the Department of Health in their 1961 investigations.

During these investigations, the river was reported as being highly colored with solids characteristic of packing house wastes in particular.

From a biological standpoint the presence of tubifex worms (a sludge worm) and various forms of small shell life were the only forms of aquatic flora and fauna reported.

A continuing assessment of the biological character of the river, and the sludge deposits is needed for the entire river stretch under consideration. Identification of the industrial sources of both organic and inorganic solids should also be made, because of the lack of recent data in some cases.

OIL

One dramatic effect of oil pollution is its killing power on aquatic and wildlife. This has been very vividly described earlier by Governors Reynolds and Rolvaag.

One other effect of the oil spill was the polymerization of the soy oil which resulted in the formation of spongy "blankets," or "ropes," which were either deposited on the beds of the rivers and lakes or were blown onto the shores. The beach at Bay City, Wisconsin, in particular, is still apparently feeling the effects of this pollution.

The problem of accidental oil spills is a continuing one and major steps must be taken from both a legal and preventive control standpoint.

ALGAE

Wastes containing nitrogen and phosphorus (fertilizers) pollute our waters and contribute to the increase of certain organism populations. Organism populations reach such magnitudes that water uses are interfered with and nuisances are created.

As reported in the State of Minnesota 1960-1961 survey, both phosphorous and total nitrogen increased four-fold as the river passed through the metropolitan complex.

The present and future effects on the total water resource of the area should be determined with respect to these important water quality indices which may contribute or trigger the growth of nuisance blooms of algae.

TASTES AND ODORS

Over the years, a continuing complaint reaching the Minnesota Department of Conservation has been the off-tastes of fish caught in various stretches of the Mississippi River in the Twin Cities area. These reports have mainly concerned fish taken in the reach above the Hastings Dam with occasional complaints coming from as far south as Red Wing and Lake Pepin.

A wide variety of substances has been suggested as agents producing tastes and odors in water and off-flavor in fish flesh. The better known compounds include phenolics, mercaptans, and other complex aromatic organic substances. Not to be dismissed, though, is the taste and odor producing capability of many algal forms.

Evaluations of taste and odor problems in the Mississippi River in the Twin Cities area have been attempted in the past but no formal report was developed and the results were apparently inconclusive.

The need for an intensive review of this water quality problem is necessary in the development of an overall water quality control program.

PESTICIDES

Estimates on total poundage of the various pesticides, weedicides and other exotic control compounds used in the Twin Cities are are not available. Effects on water quality in the Minnesota, Mississippi, and St. Croix Rivers from these agents have yet to be assessed.

TEMPERATURE

Temperature effects resulting from both present and future thermal loads on the Mississippi and Minnesota Rivers' waste assimilation capacities in terms of dissolved oxygen during critical periods of flow have been analyzed by the University of Minnesota for the MSSD. However, the long term effects of high river water temperatures on the biota of the streams have not been fully evaluated.

CONTROL ACTIVITIES OF STATE AGENCIES

The Wisconsin Committee on Water Pollution and the Minnesota Water Pollution Control Commission adopted a joint resolution concerning waste treatment requirements for interstate waters of the St. Croix, and Upper Mississippi Rivers and their tributaries in 1953.

The two State water pollution control agencies have worked with municipalities and industries to accomplish the objectives of the joint resolution.

Of primary importance in the control of water quality in this area has been the adoption in March 1963, by the Michigan Water Resources Commission, of classification standards for the Mississippi River and its tributaries in the stretch from the Rum River to Hastings, Minnesota. Essentially, the classification program provides for three zones of varying use and quality. These range from the highest uses, including public water supply and swimming, in the zone from the Rum River to St. Anthony Falls, to waters for limited recreational, industrial and commercial use in the zone from St. Anthony Falls to the outfall of the MSSD plant; and finally, to the third zone from the MSSD plant outfall to the Hastings Dam which allows use for industrial process and general cooling, stock watering, restricted irrigation, disposal of treated wastes, fish survival and very limited recreational activities.

SUMMARY AND CONCLUSIONS

In summary, this examination of the one hundred and seven mile stretch of the Mississippi River extending from the junction with the Rum River above the Minneapolis-St. Paul Metropolitan Area downstream to the outlet of the interstate waters of Lake Pepin leads to two major conclusions:

1. Despite the efforts of the water pollution control agencies of Minnesota and Wisconsin and construction of waste treatment facilities by the Minneapolis-St. Paul Sanitary District, South St. Paul and other communities, the effects of pollution on this stretch of water are so great as to require remedial action.
2. Certain basic problems require further study. These problems range from an evaluation of all present

important sources of wastes to a projection of the impact of future discharges upon the water resources of this area.

This section of the Mississippi and the near-by sections of the Minnesota and St. Croix Rivers are used for municipal and industrial water supply, navigation, power generation, pleasure boating, swimming, commercial and recreational fishing, and waste disposal.

Wastes discharged directly to the Mississippi include about 190 million gallons from treated municipal sources and at least another 20 million gallons from industrial process sources each day. The Minnesota River receives and delivers to the Mississippi about 24 million gallons of treated and untreated municipal and industrial wastes daily. Over three-quarters of a billion gallons of river water each day are used for cooling purposes.

There are 29 municipal sewage treatment plants in the area serving a total population of more than 1 million persons. These plants discharge 200 million gallons of treated sewage each day. Almost all of the sewage is discharged from two plants - the Minneapolis-St. Paul Sanitary District and the City of South St. Paul.

Seventeen industries, processing a wide variety of products, discharge treated and untreated wastes directly

Reproduced from best available copy.

to the Mississippi River. Principal constituents are oil, phenols, ammonia, oxygen-demanding materials, and suspended solids. In addition, twelve industries discharge wastes to the Minnesota River in the stretch from Mankato, Minnesota, to the mouth. The discharge of all these wastes, both municipal and industrial, influences water quality.

Minnesota's basic guide for bathing or swimming waters requires as an upper limit an arithmetic average "most probable number" of 1,000 coliforms/100 ml during any one month of the recreational season, although this is subject to variance depending upon the results of a sanitary survey. The monthly average coliform counts for 1962 above St. Anthony Falls were 7,700 MPN/100 ml in July; 810,000 MPN/100 ml for September at Fort Snelling bridge above the Minnesota River; 43,000 MPN/100 ml in the Minnesota River during September, 1962; and six miles below the Minneapolis-St. Paul Sanitary District MSSD outfall coliform levels during August averaged 2,100,000 MPN/100 ml. High levels were also found in the interstate stretch of the Mississippi River below Prescott, Wisconsin, and Hastings, Minnesota, at Diamond Bluff, and at Red Wing. Even at Frontenac, Minnesota, on Lake Pepin the average coliforms for the month of July 1962 reached 9,100 MPN/100 ml. On the other hand the St. Croix River appeared to be in good condition based upon available bacteriological information. For most stretches of the Mississippi and Minnesota Rivers for which data are available, the coliform counts for intimate water contact sports always exceeded normally acceptable levels.

This excessive bacterial contamination presents a health hazard to recreational users on the Mississippi River from above St. Anthony Falls to Lake Pepin as well as to those who use the Minnesota River. Despite these health hazards, thousands of pleasure boaters and hundreds of water skiers use the waters of the Mississippi and Minnesota Rivers.

Raw sewage and surface run-off from almost eighty diversion structures on the combined sewage collection systems overflow at various times throughout the metropolitan area. They add to the hazard of bacterial contamination and produce visual nuisances on the surface of the water.

Oil from industrial sources and particularly from the recent accidental spills from storage facilities has killed thousands of ducks, fouled boats, and caused unsightly scum on the waters and beaches over wide areas. Most of the oil pollution results from oil leaks and spills with minimum amounts contributed by bilge pumpage from tow boats.

Fishermen, both sport and commercial, have been plagued on a continuing basis with tainted flesh in fish taken from the waters of the Mississippi River. The effects of phenols and other chemical constituents as well as algae on the production of taste and odors have yet to be evaluated.

River bottom sludge banks extend 20 miles down the Mississippi River to the Hastings Dam with depths ranging up to 4-1/2 feet. A high Bio-Chemical Oxygen Demand (BOD) from this and other sources has caused total depletion of oxygen in almost 7.5 miles of the river beginning a half mile below the MSSD plant. Noxious odors and floating sludge provide a nuisance setting for any water user in the area. The replacement of desirable bottom life with pollution tolerant forms has been reported in a limited biological investigation. Feeding and spawning grounds for fish propagation are eliminated by the deposition of sludge.

The effect of water temperature is a water quality factor to be considered in the metropolitan area. Evaluations have been made on the relationship of water temperature to dissolved oxygen in terms of waste assimilation capacities of the Minnesota and Mississippi Rivers. The long term effects on the biota of the streams, however, as well as the more subtle effects on various chemical constituents of the river water have yet to be fully assessed.

Some of the problems requiring further study are evident:

* Studies of all important sources of waste

should be undertaken so that the pollutional effects of each can be evaluated and acted upon.

* The specific industrial and other sources of wastes on the Minnesota River should be determined in like fashion.

* The overall effects of storm water overflows should be further evaluated.

* The effect of sludge deposits on bottom organisms which serve as a link in the fish food chain should be investigated further.

* The sources of all bacterial contamination of the Mississippi River should be identified. This should involve special quantitative studies of the possible fecal nature of the coliforms present.

* More thorough evaluation of the nutrient load and impact on undesirable algae production should be made.

* The links between water quality and off taste in fish flesh should be identified.

* Finally, the projection of the impact of present and future waste sources upon the area water quality is a matter requiring high priority if area water resources are to be used to their maximum.

It is evident that pollution of the waters of the Mississippi River, and significant tributaries in Minnesota and Wisconsin within the Minneapolis-St. Paul Metropolitan Area and downstream into Lake Pepin, causes hazards to health or welfare of persons using these waters, and as such is subject to enforcement under provisions of the Federal Water Pollution Control Act (33 U.S.C. 466 et.seq.).

(The written report prepared by Mr. Rademacher is as follows:)

FOREWORD

This is a technical report on pollution problems on the Mississippi River in an area from the juncture of the Mississippi River with the Rum River above the Minneapolis-St. Paul metropolitan complex through the Lake Pepin outlet, one hundred and seven miles downstream. The significant tributaries to the Mississippi River, the Minnesota and St. Croix Rivers are included in view of their possible influence on Mississippi River water quality. The purpose of this report, which is based on available data obtained from State and local groups, is to examine and report on the uses made of the area's waters and on the existing sources of pollution.

The cooperation provided by these agencies, particularly the Minnesota Water Pollution Control Commission and the Wisconsin Committee on Water Pollution, in supplying the necessary information and in the review of drafts of the text for factual content should be recognized.

The report considers the quality characteristics of the water as they exist today, and evaluates the effects of waste discharges on water quality and water uses. The report contains conclusions thought to be justified on the basis of information presently available, and suggests areas in which additional investigations are needed.

BACKGROUND

In letters from Governor Karl A. Rolvaag of Minnesota and Governor John W. Reynolds of Wisconsin to Secretary Anthony J. Celebrezze of the Department of Health, Education, and Welfare on September 9, 1963, a request was made for action to abate pollution in the area as provided in the enforcement provisions of Section 8 of the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.).

In response to the request of the Governors, on September 23, 1963, Secretary Celebrezze sent letters calling for a conference in accordance with Section 8 of the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.) in the matter of pollution of the waters of the Mississippi River and its tributaries to official water pollution control agencies for the States of Minnesota and Wisconsin.

A formal public announcement of the conference and the initiation of a pollution study was made by the late President, John F. Kennedy, in a speech at Ashland, Wisconsin, on September 24, 1963.

Two major oil spills on the Minnesota River

J. M. Rademacher

during the winter of 1962-63 resulted in the fouling of the Minnesota and Mississippi Rivers for a distance of over 100 miles and in the killing of several thousand ducks and other birds during the spring migration. Though these spills were recognized as accidental and extraordinary, they triggered an awareness of the overall pollution problems in the Mississippi River which work an economic hardship on the States of Minnesota and Wisconsin in terms of recreation and clean water for other purposes.

THE AREA

The States of Minnesota and Wisconsin are regarded as prime water playgrounds of the Middle West and the Nation. The Mississippi River has its origin in Minnesota and forms a common boundary between the two States as it wends its way to the Gulf of Mexico. This river is a natural present and future resource for both States.

The Conference Area, a very important segment of this river complex, extends from the mouth of the Rum River in Minnesota to the outlet of Lake Pepin. A distance of approximately 107 miles along the main stem of the Mississippi River is covered. The lower reaches of the Minnesota and St. Croix Rivers, which are tributary to the main stem, are also included within the Conference Area.

The Mississippi River within this reach has six slack water pools formed by dams across the river constructed for navigation and/or power purposes. With the completion of the St. Anthony Falls Lock in September 1963 by the Corps of Engineers, navigation in a nine-foot channel is possible through the entire metropolitan area. Physically, the Mississippi River is a study in contrast. Entering the metropolitan area the river drops rapidly with a 30-foot fall at Coon Rapids Dam, 75 feet more at the St. Anthony Falls in downtown Minneapolis, and another 38 feet at the Twin Cities Lock and Dam No. 1 some six miles further downstream. From this point the river drops only 20 feet in the remaining 88 miles to the outlet of Lake Pepin. Within this latter stretch the Minnesota River joins the main stem some nine miles below Lock and Dam No. 1 and the interstate St. Croix River combines with the Mississippi River about forty-one miles below the same dam to continue that common boundary between Wisconsin and Minnesota.

Lake Pepin covers the last twenty-two-mile stretch of the river under consideration. Whereas the controlled backwater lakes formed by the dams at Red Wing and Hastings are relatively shallow, Lake Pepin has an average depth of 25 to 35 feet throughout its main portion. The lake's beauty rivals many other natural assets of the two States, which share it.

The uses of the particular stretch of the Upper Mississippi River described are governed by people and their activities. Twelve counties -- nine in Minnesota and three in Wisconsin -- have direct influences on the Mississippi River and its main tributaries, the Minnesota and St. Croix Rivers. All of these excepting Carver and Scott Counties in Minnesota and St. Croix County in Wisconsin border on the main stem of the Mississippi River.

On the basis of the 1960 Census, the population of these 12 counties was 1,634,328. Portions of or all of seven Minnesota counties (Anoka, Hennepin, Ramsey, Washington, Dakota, Scott, and Carver) comprise the Minneapolis-St. Paul Metropolitan Area with a 1960 population of 1,525,297. The downriver areas are relatively sparsely populated in both Wisconsin and Minnesota. However, the picture for this entire area will be drastically changed if the estimates of the demographers and economists are even approximated. They feel that this area will have almost three million people by the year 2000, if present trends continue. All these additional waste producers, with all their supporting commercial and industrial activities, will have available for use the river with no change in volume.

A wide variation in flows is experienced over the years by the Mississippi River. The following table prepared from information collected by the U. S. Geological Survey reflects the minimum, maximum, and average flow conditions in terms of cubic feet of water per second. The Mississippi River, as well as the St. Croix and Minnesota River, are to some extent affected by upstream storage reservoirs, from which water is released for such purposes as flood control, power and navigation.

TABLE 1

STREAM FLOW DATA IN CUBIC FEET PER SECOND

Location of Gaging Station	Year of Record	Average Flow	Maximum Flow	Minimum Flow
Coon Rapids Dam	28	6,903	75,900	586
St. Paul, Minn.	61	9,832	125,000	632
Prescott, Wisc.	31	14,810	155,000	1,380

(Figures 2, 3 and 4 are as follows:)

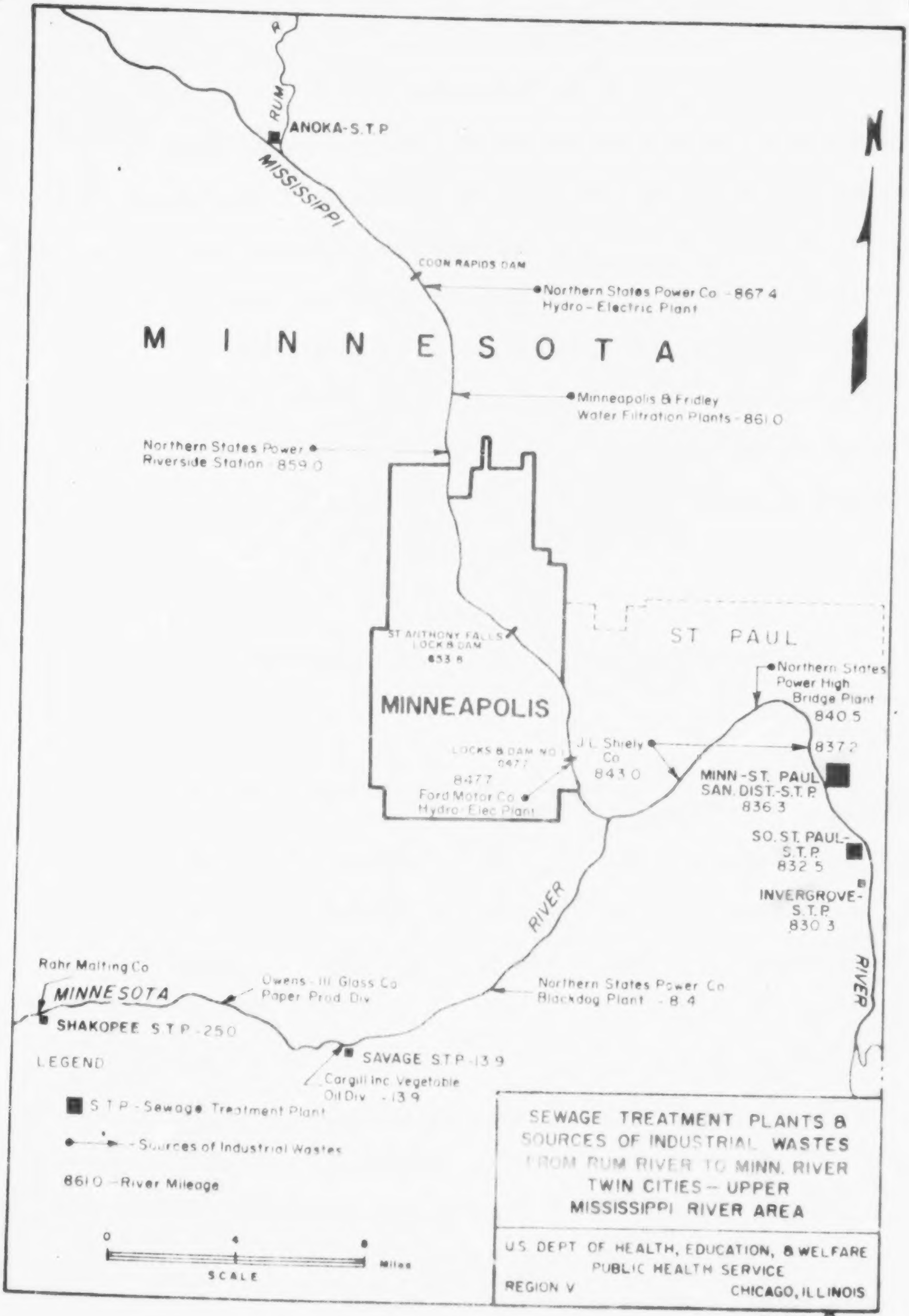
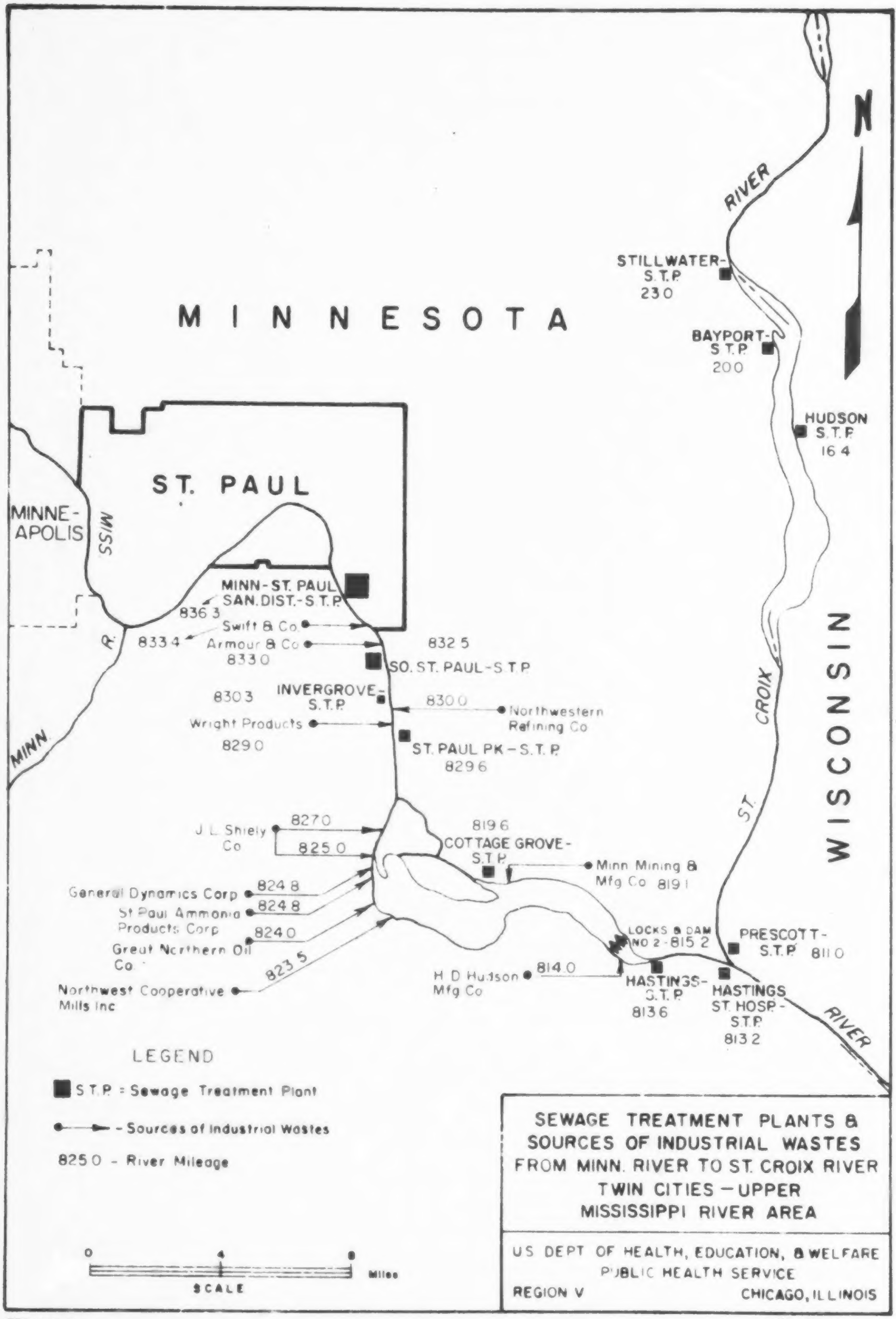

RUM R
ANOKA-S.T.P.
MISSISSIPPI
COON RAPIDS DAM
Northern States Power Co. - 867.4 Hydro - Electric Plant
M I N N E S O T A
N
Minneapolis & Fridley Water Filtration Plants - 861.0
Northern States Power Riverside Station - 859.0
ST PAUL
ST ANTHONY FALLS LOCK & DAM 853.8
MINNEAPOLIS
Northern States Power High Bridge Plant 840.5
LOCKS & DAM NO 1 847.7
847.7
Ford Motor Co. Hydro-Elec Plant
J.L. Shiely Co 843.0
837.2
MINN-ST. PAUL SAN. DIST.-S.T.P. 836.3
SO. ST. PAUL-S.T.P. 832.5
INVERGROVE-S.T.P. 830.3
RIVER
RIVER
Rahr Malting Co
MINNESOTA
Owens - Ill. Glass Co. Paper Prod. Div.
Northern States Power Co. Blackdog Plant - 8.4
SHAKOPEE S.T.P. - 25.0
SAVAGE S.T.P. - 13.9
Cargill Inc. Vegetable Oil Div. - 13.9
LEGEND
■ S.T.P. - Sewage Treatment Plant
Sources of Industrial Wastes
861.0 - River Mileage
0
4
8
Miles
SCALE
SEWAGE TREATMENT PLANTS & SOURCES OF INDUSTRIAL WASTES FROM RUM RIVER TO MINN. RIVER TWIN CITIES — UPPER MISSISSIPPI RIVER AREA
U.S. DEPT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V
CHICAGO, ILLINOIS

FIGURE 2

8amr

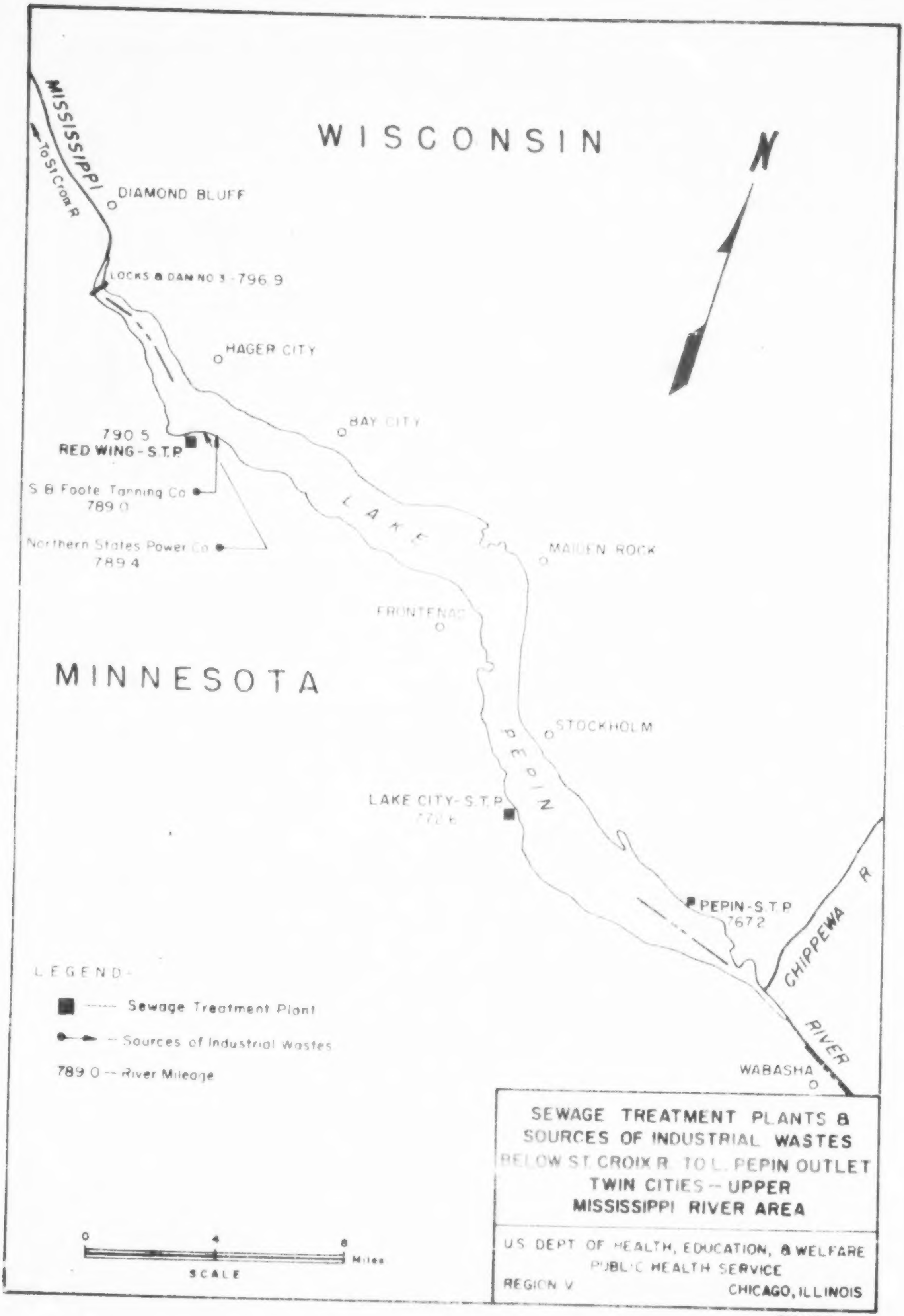

MINNESOTA
WISCONSIN
N
ST. PAUL
MINNE-
APOLIS
MISS
R.
MINN.
RIVER
ST. CROIX
RIVER
STILLWATER-
S.T.P.
23.0
BAYPORT-
S.T.P.
20.0
HUDSON
S.T.P.
16.4
MINN-ST. PAUL
SAN. DIST.-S.T.P.
836.3
Swift & Co.
833.4
Armour & Co.
833.0
832.5
SO. ST. PAUL-S.T.P.
830.3
INVERGROVE-
S.T.P.
830.0
Northwestern
Refining Co.
Wright Products
829.0
ST. PAUL PK-S.T.P.
829.6
J.L. Shiely
Co.
827.0
825.0
819.6
COTTAGE GROVE-
S.T.P.
Minn Mining &
Mfg Co. 819.1
General Dynamics Corp.
824.8
St. Paul Ammonia
Products Corp.
824.8
824.0
Great Northern Oil
Co.
823.5
Northwest Cooperative
Mills Inc.
LOCKS & DAM
NO. 2 - 815.2
PRESCOTT-
S.T.P.
811.0
H.D. Hudson
Mfg Co.
814.0
HASTINGS-
S.T.P.
813.6
HASTINGS
ST. HOSP.-
S.T.P.
813.2
LEGEND
■ S.T.P. = Sewage Treatment Plant
●——► - Sources of Industrial Wastes
825.0 - River Mileage
0
4
8
Miles
SCALE

SEWAGE TREATMENT PLANTS &
SOURCES OF INDUSTRIAL WASTES
FROM MINN. RIVER TO ST. CROIX RIVER
TWIN CITIES — UPPER
MISSISSIPPI RIVER AREA

U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V CHICAGO, ILLINOIS

GPO 807-098-3

FIGURE 3


WISCONSIN
MINNESOTA
N
MISSISSIPPI
To St. Croix R.
DIAMOND BLUFF
LOCKS & DAM NO 3 - 796.9
HAGER CITY
BAY CITY
790.5
RED WING - S.T.P.
S. B. Foote Tanning Co.
789.0
Northern States Power Co.
789.4
LAKE
MAIDEN ROCK
FRONTENAC
STOCKHOLM
PEPIN
LAKE CITY - S.T.P.
772.6
PEPIN - S.T.P.
767.2
CHIPPEWA R.
RIVER
WABASHA
LEGEND
Sewage Treatment Plant
Sources of Industrial Wastes
789.0 -- River Mileage
0
4
8
Miles
SCALE

SEWAGE TREATMENT PLANTS & SOURCES OF INDUSTRIAL WASTES BELOW ST. CROIX R. TO L. PEPIN OUTLET TWIN CITIES -- UPPER MISSISSIPPI RIVER AREA

U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V CHICAGO, ILLINOIS

FIGURE 4

WATER USES

In any metropolitan area the proper disposal of sewage and industrial wastes is essential. Practical uses of water for public and industrial supplies, navigation, commercial fisheries, or stock watering are continuing necessities. In addition, the demands of today include such uses of water as fish and wildlife propagation, and water-oriented recreational activities. This latter use includes boating, water skiing, sport fishing, camping, swimming, picnicking, and aesthetics. In a State which offers as slogans "The Land of 10,000 Lakes" or "The Land of Sky-Blue Waters," the emphasis on water-oriented recreation has great significance, particularly in the Minneapolis-St. Paul area.

Municipal Water Supply

At this time the only use made of the Mississippi River system in this area for municipal water supply is in the upper reach of the river above St. Anthony Falls. However, it is of major significance, since the City of Minneapolis obtains all of its water from this source while the City of St. Paul obtains a major supplement from the river for its Vadnais Lake system. These systems supply a number of suburban users in addition to the principal cities. At the present time the annual average daily withdrawal from the river for the two cities is approximately 75 million gallons per day, with an estimated maximum withdrawal during any one day reaching about 200 MGD. About 58 percent of the people living in the metropolitan area are served by the two supplies.

Future adequacy of supply for the Twin Cities is discussed in a publication of the Minnesota Department of Conservation, "Water Resources of the Minneapolis-St. Paul Metropolitan Area," Bulletin No. 11. In this report, the Department of Conservation estimates that by 1980 a minimum flow of 1,000 cfs in the Mississippi would not be able to meet the combined requirements for public water supply (est. 310 cfs. average with a 620 cfs maximum), navigation (350 cfs required to operate the locks at St. Anthony Falls), the Riverside power plant (340 cfs) and hydroelectric power generation. Under these conditions of flow (1,000 cfs) and use, the hydroelectric power plants at St. Anthony Falls would not be able to operate.

The cities of Minneapolis and St. Paul have investigated supplemental sources of surface water supply and have concentrated on the St. Croix River and even Lake Superior as possibilities. With a variety of factors including suitable water quality to consider, the interstate stretch of the Mississippi River has not been a serious contender as a source of supply.

Industrial and Commercial Water Supply

The metropolitan area is supported by a variety of water-using industries including meat packing, brewing, paper products, petroleum refining, milling, mineral and rubber products industries, as well as chemical and allied products industries. Almost 70 percent of the water used by industry is ground water. Of the surface water used by industry over 99 percent is supplied by the Minneapolis and St. Paul municipal systems. Over 126 MGD is used by commerce and industry in the Twin Cities area.

Power - Steam and Hydroelectric Generation

Steam power plants on the Mississippi and Minnesota Rivers in the immediate area of the Twin Cities are the biggest users of water with almost four times the water use of the municipalities and industries combined.

Almost 868 MGD was the average daily use by the two plants located on the Mississippi River and one plant on the Minnesota River in 1961, all of which is returned to the stream at a higher temperature. The capacity of each of these plants, in addition to power plants located at Mankato, Minnesota, and Red Wing, Minnesota, are described in the following table.

(Table 2 is as follows:)

14amr

TABLE 2

STEAM AND HYDRO-ELECTRIC GENERATING PLANTS ON THE MISSISSIPPI AND MINNESOTA RIVERS

Twin Cities Area

NAME AND LOCATION	GENERATING * CAPACITY (KW)	MAXIMUM RIVER * INTAKE (MGD)
Steam Plants Mississippi River		
Riverside Plant	502,300 (1964)	490
High Bridge Plant	460,900	462
Red Wing Plant	25,000	54
Minnesota River		
Mankato Plant (Wilmarth Plant)	25,000	36
Black Dog Plant	260,000	396
Hydro-Electric Plants		
Coon Rapids Dam	8,240	4,200 MGD
Upper St. Anthony Falls(Main St. Plant)	960	2,600 MGD
Upper St. Anthony Falls(Hennepin Island Plant)	9,900	
Lower St. Anthony Falls	8,000	3,600 MGD
Ford Unit - Lock and Dam #1	13,930	3,880 MGD

* This information has been obtained from Bulletin No. 11 of the Minnesota State Department of Conservation, Division of Water. (MGD - million gallons per day)

** Data obtained from "Pollution and Recovery Characteristics of the Mississippi River", M.S.S.D. p. 167.

At this time only the Black Dog plant of the Northern States Power Company has a cooling pond to reduce the thermal load on the Minnesota River and to serve as a reservoir during critical periods of low river flow.

An expansion of major proportions at the Riverside Plant is underway and is scheduled for completion in 1964. Within the next few years (1970) the first unit of a 1,000,000 KW plant will be built on the Mississippi River below the Minneapolis-St. Paul Sanitary District waste treatment plant. Initially, it will have a capacity of 500,000 KW. Known as the R. F. Pack plant, it will have a counterpart, the Prairie Island Plant, built in the succeeding decade at Red Wing, Minnesota. It also will have a capacity of 1,000,000 KW.

The hydroelectric power generation capacity is limited to the upper section of the Mississippi River above its juncture with the Minnesota River. The total hydroelectric generating capacity is only about 4 percent of the total steam power plant capacity in the area. With increased municipal and navigational demands for water above the falls, operation of these hydroelectric units will be limited during low stream flows.

Commercial Fishing

Over the years millions of pounds of fish have been harvested by commercial fishermen on the Mississippi River. Complete records are available in the Annual Reports of the Upper Mississippi River Conservation Committee on size and variety of catches in all pools of the interstate sections of the river starting with Pool Number 3 above Red Wing, Minnesota.

Lake Pepin in Pool Number 4 has always been a major source of marketable fish. During 1961, for example, the total commercial catch for Pool 4 was 1,736,714 pounds, valued at over $81,000. Pool 3, on the other hand, had a total commercial catch of 104,180 pounds, valued at about $4,000. Carp is the predominant specie in the commercial catch and amounted to 94.5 percent of the total in Pool 3 and 93 percent in Pool 4.

Although specie variation and catch are influenced by such factors as canalization of the river, market demands and various other technical factors and needs involved in the commercial fishery operation, the quality of water also has a significant bearing on the matter. Along with other biological factors, the dominance of rough fish within a stream sector is used as one of the indicators of poor water quality by the aquatic biologists. Carp are considered representative of the more pollution-tolerant species of rough fish. Within the limitations cited, a general impression of the Mississippi River may be developed by comparing the ratio of carp to the total commercial catch during 1961 proceeding downstream on a pool-by-pool basis, as follows:

Pool 3 - 94.5%
Pool 4 - 93%
Pool 5&5a - 70%
Pool 6 - 60%
Pool 7 - 48%
Pool 8 - 53% (LaCrosse, Wisconsin, located on this pool)
Pool 9 - 50%

There is no commercial fishing in Pool 1. The Minnesota Department of Conservation reports that the average annual commercial catch for the 1959-62 period was 330,955 pounds in Pool 2.

In waters common to the States of Minnesota and Wisconsin in Pool 3 through Pool 8, 88% of the commercial catch was caught by Wisconsin fishermen and 12% by Minnesota commercial fishermen in 1961.

Stock Watering and Irrigation

Supplemental irrigation is practiced to a limited extent in the Twin Cities area. Most water for this purpose is obtained from wells for the estimated 4,000 acres that are under such control. Approximately 116 million gallons of water per year are used to increase production of agricultural crops in this manner, according to the Minnesota Conservation Department.

Stock watering in the area is reported to use approximately 2 MGD. However, most stock-raising activity is off the main stem of the Mississippi River except for an area in the vicinity of Hastings, Minnesota.

Navigation

The Twin Cities complex is the headwaters port for the Mississippi River and as such is a major marketing, distribution and transportation center. Barge traffic on the Mississippi and Minnesota Rivers, and to a minor degree on the St. Croix River, account for millions of tons of cargo shipped into and out of the area each year. Over 5 million tons of cargo were handled in the ports of Minneapolis and St. Paul during 1963. With the completion of the 9-foot channel above St. Anthony Falls in September 1963 and development of adequate docking facilities, the Corps of Engineers estimates that over 2,000,000 tons of cargo will be locked through the St. Anthony Falls Lock each year.

These vessels transport primarily petroleum products, coal, sand, gravel, grain and soybeans. The waterway has a normal operating season from late March to early December.

Fish and Wildlife Habitat

The Mississippi River is a prime source for a wide variety of fish. The type and preponderance of the fish population is in large part dictated by the habitat of the stream and its water quality. Factors such as stream depth, canalization, commercial traffic, weed growth, food sources, and spawning suitability affect habitat in general. Water quality includes such factors as dissolved oxygen levels, temperature, turbidity, nutrient levels, as well as chemical concentrations.

The species of fish in the stretch of the Mississippi River under consideration range from game to rough. They include walleyed pike, northern pike, largemouth and smallmouth bass, panfish and a great variety of rough fish dominated by carp.

The bulk of the game fish are found in the St. Croix River, in Lake Pepin, in Pool 3 above Red Wing, and in the section above St. Anthony Falls. Carp, a rough fish, is reported to be a dominant specie in most sections. It is reported by the Minnesota Department of Conservation that on the basis of a 1956 survey, game fish in the Hastings Pool (L.&D. #2) were roughly half as abundant as in the Red Wing Pool (L.&D. #3).

Wildfowl

The Mississippi River is a major artery in the continental system of flyways serving the wildfowl migrations. Each year thousands of ducks, geese, and other migratory birds have made their annual trek to and from the northlands using the Mississippi River as a way-station in their travels.

The State of Minnesota has recogized the importance of wildlife preservation in this area and has developed the 5,430-acre Gores Pool Number 3 Game Refuge and Public Hunting Grounds some six miles southeast of Hastings.

Of incidental importance is the mammoth Upper Mississippi River Wildlife and Fish Refuge, which was developed by the Federal Government, and extends some 284 miles immediately below the outlet of Lake Pepin. Although not in the area specifically under review, this major wildlife resource is dependent on good water quality. Like the State game refuge, it attracts many thousands of hunting enthusiasts from the metropolitan area. No precise figures are available of hunters or of birds bagged at these sporting resources located at the hunter's doorstep.

Recreation

The use of outdoor recreational facilities is growing rapidly in Minnesota and Wisconsin. With the number of camper days in the State parks increasing 600 percent in the last five years as an indication, recreation is the fourth largest industry in the State of Minnesota. A similar pattern has been set in Wisconsin with an increase from 158,000 camper days in 1957 to 847,000 in 1962. As an industry, recreation is in the top five for the State of Wisconsin. Both States are exerting efforts to keep pace with this growth.

In Wisconsin, the Outdoor Recreation Act of 1961 authorized a one cent tax on cigarettes for acquisition of lands for hunting, fishing, parks and other recreational purposes. $100,000 have been authorized for planning for recreational development within that State.

With this growth, in 1963 the Minnesota legislature passed an Omnibus Natural Resources Bill, designed both to enlarge economic opportunities and increase the citizen's enjoyment of his leisure time. A 1961 law allowing the use of a portion of unclaimed refundable State gasoline tax for the acquisition, improvement and maintenance of public access to the State's waters, was an earlier step toward the development and expansion of recreational facilities on the numerous waters of the State. The citizens of the Twin Cities metropolitan area consider these legislative actions as a method of expanding their recreational facilities from inland lakes to the great potential locations along such principal rivers as the Mississippi, Minnesota and St. Croix.

Swimming and Water Skiing

Swimming in the waters under consideration is almost totally confined to the St. Croix River and Lake Pepin. Lake Pepin has several fine beaches at Bay City, Wisconsin, and Lake City, Minnesota, as well as resort areas below Red Wing, Minnesota, and are regularly used by swimmers. No estimates of their number are available. The recreational use map indicates the locations of beaches in the area.

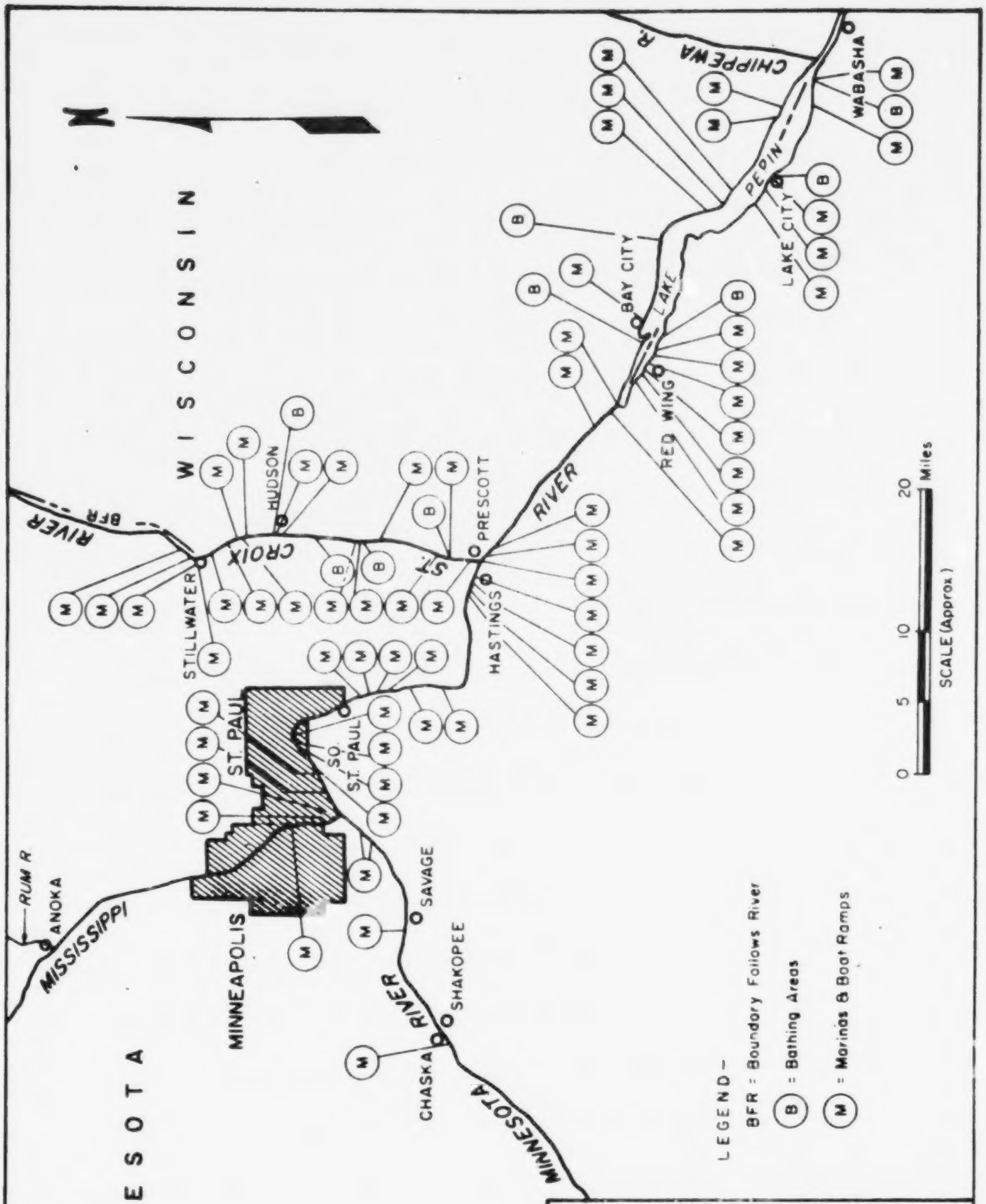
The increased horsepower available in today's marine outboard and inboard motors has given impetus to the sport of water skiing. It is particularly popular in the Twin Cities area of Minnesota and Wisconsin. The waters of Lake Pepin and the expanses of open water created by the backwaters of the dams provide an ever-increasing challenge to the water skier. Skiers have also used the Mississippi River below the Rum River for this particular sport.

Pleasure Boating

The popularity of pleasure boating in Wisconsin and Minnesota is great and can be measured in many ways. According to the Outdoor Boating Club, some 273,000 motors were in use in Minnesota and 232,000 motors in use in Wisconsin, for a total of 505,000 as of December 31, 1963. In Minneapolis-St. Paul alone approximately 131,000 motors were in use in this marketing area. Minneapolis is fifth among the nation's leading cities in outboard motor sales and motors in use. This represents a sizable boon to the economy of the area, with millions of dollars invested in boats, motors, accessories, insurance, docking, storage, maintenance and repairs.

Pleasure boat marinas dot this waterway. The major concentrations are located on the St. Croix River,

24amr


MINNESOTA
WISCONSIN
MISSISSIPPI
RUM R
ANOKA
MINNEAPOLIS
ST. PAUL
SO. ST. PAUL
SAVAGE
SHAKOPEE
CHASKA
MINNESOTA RIVER
STILLWATER
ST. CROIX RIVER
BFR
HUDSON
PRESCOTT
HASTINGS
RIVER
RED WING
BAY CITY
LAKE PEPIN
LAKE CITY
WABASHA
CHIPPEWA R.
M
B
N
LEGEND –
BFR : Boundary Follows River
B : Bathing Areas
M : Marinas & Boat Ramps
0
5
10
20 Miles
SCALE (Approx)

RECREATIONAL USES
TWIN CITIES — UPPER
MISSISSIPPI RIVER AREA

U.S. DEPT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V CHICAGO, ILLINOIS

FIGURE 5

on the Mississippi River at Prescott, Wisconsin, at Hastings, and Red Wing, Minnesota, and at Lake City, Minnesota on Lake Pepin. Close into the Twin Cities, marinas have also been established on the Mississippi River below Lock and Dam #1. Both public and private launching ramps for trailered boats are sprinkled along the lower reaches of the Mississippi River in Pool 2 and 3 and Lake Pepin. A recreational use map shows that the St. Croix River has 13 marinas and 15 launching ramps. The Minnesota River has four marinas and 2 launching ramps. The Mississippi River below Lock and Dam #1 to the confluence with the Minnesota River has 3 marinas and 2 launching ramps. In the area from the entrance of the Minnesota River to Lock and Dam #2, at Hastings, 12 marinas and 8 launching ramps are located. From Lock and Dam #2 to Lock and Dam #3, above Red Wing, there are 7 marinas and 4 launching ramps primarily in the Hastings and Prescott area. In the much frequented stretch of the Mississippi from Lock and Dam #3 to the outlet of Lake Pepin, 19 marinas and 13 launching ramps are in use.

The Metropolitan Area of Minneapolis-St. Paul has hundreds of lakes which receive intensive use and have their shores lined with homes. However, the needs have not been satisfied and pressures are constant for more recreational waters within easy access.

With the completion of the St. Anthony Falls Lock, the entire stretch of the Mississippi River to Coon Rapids Dam is accessible for boating. The Minnesota River is also navigable for pleasure boating for a distance of 25 miles to Shakopee, Minnesota. The St. Croix is a prime area for recreational boating of all types.

The relative use of the pools can be gauged from lockage counts. In the report, "Pleasure boats through Locks - Mississippi River, St. Paul District," by the U. S. Army Engineer District, St. Paul, St. Paul, Minnesota, the 1962 figures were for St. Anthony Falls Lock, 1 boat; for Lock #1, 959 boats, for Lock #2, 4,270 boats; for Lock #3, 4,501 boats; and for Lock #4, 3,943 boats.

Sports Fishing

Fishing is an important recreational activity in the Minneapolis-St. Paul to Lake Pepin area both in summer and winter. Studies on sport fishing conducted in areas similar to the Minneapolis-St. Paul area have shown as many as 75 percent of all available boats were used for fishing. On that basis, it appears that as many as 100,000 boats may be used for fishing in this area.

A further indication of sports fishing interest is the number of fishing licenses issued in the several counties included in the area. During the past year, the total number of persons using licenses was 374,420, or almost 23 percent of the resident population. A breakdown by county follows:

(Table 3 is as follows:)

374,420, or almost 23% of the resident population. A breakdown by county follows:

28amr

TABLE 3

FISHING LICENSES ISSUED IN

TWIN CITIES METROPOLITAN AREA

COUNTY	NO. OF PERSONS LICENSED *	COUNTY POPULATION
Anoka	24,717	85,962
Hennepin	195,170	842,854
Ramsey	74,125	422,525
Washington	34,960	52,432
Dakota	17,316	78,303
Goodhue	9,330	33,035
Wabasha	6,637	17,007
Minnesota Totals	362,255	1,532,118
St. Croix	6,670	29,164
Pierce	3,953	22,503
Pepin	1,542	7,332
Wisconsin Totals	12,165	58,999
Area Total	374,420	1,591,117

* This breakdown necessary because of the three classes of licenses issued by the State of Minnesota.

Ice fishing is also a popular sport along the river and on a typical winter day several hundred fishing shanties and anglers may be seen on the Mississippi River and Lake Pepin.

Water Oriented Parks and Aesthetics

The waters of the Upper Mississippi River are a focal point for parks and recreation areas.

Stillwater Park and Bayport City Park are located on the St. Croix

Ice fishing is also a popular sport along the river and on a typical winter day several hundred fishing shanties and anglers may be seen on the Mississippi River and Lake Pepin.

Water-Oriented Parks and Aesthetics

The waters of the Upper Mississippi River are a focal point for parks and recreation areas.

Stillwater Park and Bayport City Park are located on the St. Croix River. Along the Mississippi River are Hastings Park, Commissary Point picnic area, Colville Park, and Bay City Picnic Grounds. Frontenac State Park, located in Goodhue County, Minnesota, is the site of the State's first summer resort. Nearby is the famed Maiden Rock, in Wisconsin, a site that attracts many visitors.

William O'Brien State Park consists of 256 acres of wooded, rolling land fronting for almost a mile on the St. Croix River in Washington County. The Minnesota Conservation Department reports that a future State park will include part of Fort Snelling, Pike Island and adjacent parts of the Minnesota River Valley. Part of the Crosby farm, located in St. Paul, along the left bank of the Mississippi River below Fort Snelling, may become a new city park.

Access to the Mississippi River above Lake Pepin to Prescott, Wisconsin, is somewhat restricted by the railroads which form iron bands binding the river on either side. However, the proposed development of the Great River Road should open this entire scenic stretch from Prescott, Wisconsin, through Lake Pepin. An increasing demand for quality water to satisfy the developing recreational uses can be expected.

Waste Disposal

The waters of the area receive and carry away the sewage, industrial and other liquid wastes produced by the varied activities of the population. In the Twin Cities area waste disposal has become the dominant use below the MSSD outfall.

The Mississippi River in this area receives over a billion gallons of waste water daily, including sewage, industrial process water and cooling water. Wastes discharged directly to the Mississippi River include approximately 190 million gallons from municipal sources and at least another 20 million gallons of industrial wastes per day. The Minnesota River receives and delivers to the

Mississippi River about 24 million gallons of municipal and industrial wastes daily. Over 900 MGD of cooling water were discharged from the area's power plants.

SOURCES OF WASTES

Municipal sewage, industrial wastes and heat are the principal pollutional materials discharged continuously into the waters of the Twin Cities area. Other wastes discharged intermittently may have serious local effects or may cause temporary excessive pollution. Among these wastes are accidental spills from storage tanks, barges, etc., combined sewer overflows, sewage from river front homes, wastes from barge tows and pleasure craft, and materials from dredging operations.

SEWAGE

The following table contains information on sources and characteristics of sewage discharged from various sources into the waters of the Twin Cities area.

(Table 4 is as follows:)

TABLE 4

Inventory of Municipal Waste

Source	Approx. River Mile	Pop. Equiv. Raw	Treatment	Est. Flow MGD	Type of System *	P.E. ** Disc. to Stream	Est. S.S. Disc. to Stream #'s/day
Rum River							
Nike Site #90	---	I.N.A.	2-CL	.010	I.N.A.	I.N.A.	I.N.A.
Mississippi River							
Anoka	871.6	15,000	2-CL	1.0	S	3,600	I.N.A.
Minneapolis, Combined sewer by-passes	---	Und.	None	Und.	C	Und.	Und.
St.Paul, Combined sewer by-passes	---	Und.	None	Und.	C	Und.	Und.
Minnesota River							
Mankato & N. Mankato, Minn.	101	42,900	1-CL	3.35	S-C	29,400	1,020E
St. Peter, Minn.	88	13,300	2-(lagoon)	0.900	C	1,380	146E
LeSueur, Minn.	73	5,000	2-(lagoon)	0.30	S	500	58E
Henderson	68	500	None	0.04	C	500	---
Belle Plaine	51	2,500	2-(lagoon)	0.15	S	250	39E

Source	Approx. River Mile	Pop. Equiv. Raw	Treatment	Est. Flow MGD	Type of System *	P.E. ** Disc to Stream	Est. S.S. Disc. to Stream #'s/day
Chaska	29.8	6,000	2-CL	0.5	S	1,200	44E
Shakopee	25.0	3,400	1-CL	0.26	S	2,300	704E
Savage	13.9	2,900	2-CL	0.215	S	430	20E
Burnsville Twp.	---	5,000E	2-CL	.500E	S	500	98E
Cedar Grove Sub.Div.	---	1,300	2-CL	0.10	S	200	29E
96TC SQD.-Air Force	---	I.N.A.	1	.002E	I.N.A.	I.N.A.	I.N.A.
Total **Minnesota** River		83,300		6.317		36,660	2,158
Mississippi River							
Minneapolis-St.Paul **San. Dist.**	836.3	1,820,000	1-C-CL	178.1	C	1,250,000	122,000
South St.Paul **Minneapolis**	832.5	818,000	3-CL	8.72	C	162,000	4,700E
Newport	---	2,349	2-CL	0.25	S	U.C.	U.C.
Inver Grove Twp.	830.3	280	2-CL	0.02	S	42E	8E
St. Paul Pk.	829.6	2,500	2-CL	0.25	S	380	57E
Cottage Grove Twp.	819.6	6,000	2-CL	0.30	S	600	78E
Hastings	813.6	12,500	1-CL	0.500	S	8,000E	630E

Source	Approx. River Mile	Pop. Equiv. Raw	Treatment	Est. Flow MGD	Type of System *	P.E. ** Disc. to Stream	Est. S.S. Disc. to Stream #'s/day
Vermillion River							
Nike Site #40	---	I.N.A.	I.N.A.	.010	I.N.A.	I.N.A.	I.N.A.
Hastings State Hosp.	---	1,000	2-CL	0.09	S	100	24E
Mississippi River							
St. Croix River							
Stillwater, Minn.	23.0	8,300	1-CL	1.6	S-C	5,533	146E
Bayport, Minn.	20.0	4,000	2-CL	0.40	S	800	204E
Hudson, Wis.	16.4	4,110	2-CL	0.40	S	438E	78E
St. Croix Totals		16,410		2.40		6,771	428
Mississippi River							
Prescott, Wis.	811.0	1,350	1	.135	S	522E	106E
Red Wing, Minn.	790.5	10,530	2-CL	1.10	C	1,400	586E
Lake City, Minn.	772.6	3,600	1-CL	0.26	S	2,200	250E
Pepin, Wis.	767.2	825	1-CL	.027	S	102E	21E
Combined Totals of All Rivers		2,793,644		199.579		1,472,577	131,046

Treatment - 1 - Primary
2 - Secondary
3 - Secondary with tertiary lagoon
C - Chemical treatment
CL - Chlorination

I.N.A. - Inf. not available   E - Estimated

* P.E. - Population Equivalent as measured by 5-day Biochemical Oxygen Demand

** Type of System - S-Separate
C-Combined

U.C. - Under Construction   S.S. - Suspended Solids

MUNICIPAL WASTES

There are 29 sewage treatment plants in the area. Treatment provided ranges from primary to a complete secondary process followed by stabilization ponds. On the Mississippi River, all sewage treatment plants have provisions for chlorination of effluents with the exception of Prescott, Wisconsin. Treatment facilities at Stillwater and Bayport, Minnesota, and Hudson, Wisconsin, on the St. Croix River, have provisions for chlorination. Of the municipal sewage treatment plants on the Minnesota River, all have chlorination facilities available except St. Peter, Le Sueur, and Belle Plaine, which use lagoons.

The treatment plants serve an estimated total population of 1,192,000. Of this population, the two major plants -- the Minneapolis-St. Paul Sanitary District and South St. Paul -- on the Mississippi River serve 89 percent of the total, or 1,061,000.

A total of 200 million gallons per day of sewage is discharged to the area's waters by the 29 treatment plants. Of this, approximately 178 MGD, or 89.3 percent, are discharged from the MSSD and South St. Paul plants.

Federal Installations

Detailed survey and evaluations of waste disposal practices at all Federal installations throughout the country are currently being made by the Public Health Service. The installations in the Twin Cities area are to be included in this program.

There are three Federal installations that reportedly discharge treated wastes to the surface waters of the Twin Cities area: the Nike site at Anoka, on the Rum River, the Nike site above Hastings on the Vermillion River, and the 96th TC Squadron Air Force facilities on the Minnesota near Wold-Chamberlain Field. These are included in Table 4.

Combined Sewer Overflows

Many of the older communities in this country have combined sewer systems. Both municipal sewage and surface run-off following rainfall are collected in the same system of sewers. The quantity of surface run-off frequently is many times that of the normal sewage flow. It is not economical to design sewage treatment plants with the capacities necessary to treat large quantities of run-off. Consequently, systems with combined sewers are designed to bypass portions of the combined sewage and surface run-off when the flows in the systems exceed the capacities of the sewage treatment plants. When overflow occurs, quantities of mixed raw sewage and surface run-off discharge through bypass devices to nearby watercourses. The Twin Cities area has a typically older, combined sewer system.

To avoid such raw sewage pollution of receiving waters, most modern communities provide separate systems for collecting sewage and surface run-off.

There are many combined sewage overflows in the collecting systems in the Twin Cities area. The previous table includes information on the types of systems installed in the area. There are over 80 storm water overflow points reported in the Twin Cities area capable of discharging to the Mississippi River. The following table reflects the results of a sampling survey by the Minnesota Department of Health in 1960-61. The report included observations of overflows from diversion structures in the area. Some of these sewers discharge pollutional material on a more or less continuous basis while the majority discharge intermittently. (Table 5)

(Table 5 is as follows:)

TABLE 5

SEWAGE DIVERSION OUTFALLS - TWIN CITIES AREA[1]

Points of Overflow	River Miles Above Mouth	Nature of Wastes
Mississippi River		
Minneapolis & St.Paul, Minn.		
Broadway Street	855.5	Light flow of sewage and oil
Nicollet Island	854.5	Sewage
Bassetts Creek	854.0	Heavy flow
Lock & Dam (St.Anthony Falls)	853.8	
8th Avenue South	853.0	Oil Slick Discoloration
10th Avenue S.E.	853.1	Heavy flow (2.4 MGD est.) sewage, feathers coliform 3100 MPN/100 ml
4th Street South	853.0 (E.)	Light flow sewage, oil film
5th Street South	852.5	Heavy flow (2.4 MGD est.) coliform 170,000 MPN/100 ml
Bridal Veil Falls	851.5	Heavy flow (3.0 MGD est.) Clear - No odor. Coliform 780 MPN/100 ml
Franklin Street	851.3	Undet. - submerged outfall
Lake Street	849.8	Light flow - clear
38th Street	848.9	Sewage - coliform 16,000,000 MPN/100 ml
Lock & Dam No. 1	847.6	
Minnehaha (Large)	847.3	Light trickle
Minnehaha (Small)	847.3	Heavy sewage discharge (.3 MGD est.) coliform >24,000,000 MPN/100 ml

Reproduced from best available copy.

39amr

TABLE 5

SEWAGE DIVERSION OUTFALLS - TWIN CITIES AREA[1]

Points of Overflow	River Miles Above Mouth	Nature of Wastes
Mississippi River		
Lock & Dam No. 1		
Eustice Avenue	849.8	Sewage and Industri coliform 20,000 MPN yellowish-brown co
Portland Avenue	849.2	Sewage (.4 MGD Est.) coliform 24,000,000 MPN/100 ml
Randolph Street W.	848.4	Sewage (0.4 MGD Est. coliform 24,000,000 MPN/100 ml
Otto Avenue W.	847.8	Sewage (1.7 MGD Est. coliform 5,400,000 MPN/100 ml
Minnesota River Mississippi River		
Davern Street	845.1	Sewage (0.2 MGD Est.) coliform 5,400,000 MPN/100 ml
Eagle Street	839.9	Sewage (0.4 MGD Est.) coliform 1,100,000 MPN/100 ml
Moses Street	839.9	Light flow (0.15 MGD Est.) coliform 780 MPN/100 ml
St.Peter Street	839.5	Sewage (0.15 MGD Est.) coliform 490,000 MPN/100 ml
Arthur Street		Light flow - sewage
Robie Street		Heavy sewage flow
Trout Brook at River	838.6	Sewage - cloudy - coliform 2,400,000 MPN/100 ml

---

[1] Observed during 1960-61 Survey - Minnesota State Department of Health

J. M. Rademacher

It is difficult to assess the pollutional effects of storm water overflows on receiving waters because there has not been sufficient study of either the characteristics of the overflows or of the effects on receiving waters during periods of overflow to develop factors that may be used in such evaluations.

Industrial Wastes

Industrial activity is concentrated almost completely in the Minnesota section of the area under consideration. The type and variety of the industries, as well as treatment provided, are listed in the following table, Table No. 6.

(Table 6 is as follows:)

Table 6
SOURCES OF INDUSTRIAL WASTES
MISSISSIPPI RIVER

Plant or Plant Division	Location	River Mile	Nature of Wastes	Waste Treatment or Control
Rum River				
Cornelius Mfg. Co.	Anoka County		Metal Fabricating	None
Federal Cartridge Co.	Anoka County		Metal Fabricating	U.N.D.
Mississippi River				
Minneapolis & Fridley **Water** Filtration Plants	42nd St. & Minn. Rt. 1 Fridley, Minn.	861.0	Water Treatment Plant Lime Sludge Discharge	Lagoons - Controlled Discharge
Northern States Power Riverside Station	Minneapolis, Minn.	859.0	Steam Power Generating Station Thermal Discharge	Ash Pond
Minnesota River				
Blue Cross Rendering Co.	Mankato, Minn.		Process & Condenser Water	Primary and Secondary
North Star Concrete Co.	Mankato, Minn.		Mfg. Gravel Washing	Tailings Basin Settling Basin
Archer Daniels Midland Co.	Mankato, Minn.		Tank Farm, Cooling Water	Oil Separation
Honeymead Products Co.	Mankato, Minn.		Vegetable Oil Processing	Oil Separator & Neutralization Tank
Northern States Power Co.	Mankato, Minn.		Condenser Water	None
Green Giant Company	LeSueur, Minn.	73	Food Processing	Fine Screens, and Ridge & Furrow Irrigation

Plant or Plant Division	Location	River Mile	Nature of Wastes	Waste Treatment or Control.
Gopher State Silica, Inc.	Henderson, Minn.	68	Sand Washing	Clarification Basins
Minnesota Valley Milk Processing Coop. Assoc.	Belle Plaine, Minn.	51	Milk Drying	None
American Crystal Sugar Co.	Carver, Minn.	32	Beer, Sugar Processing and Refining	Lime Sludge Pond
Rahr Malting Company	Shakopee, Minn.	25	Grain Malting Operation	Screens
Owens-Illinois Glass Co. Paper Products Div.	Scott County, Minn.		Paper Box Mfg.	Extended Aeration
Cargill Inc., Vegetable Oil Div.	Savage, Minn.	13.9	Vegetable Oil Processing	Oil Separation
Northern States Power Co. Blackdog Plant & Dock	Dakota County	8.4	Condensing Water	Cooling Pond
Mississippi River				
J. L. Shiely Company		843	Sand and Gravel Washing Operation	None
Northern States Power Co. High Bridge Plant	High Bridge & Smith Ave., Minneapolis	840.5	Steam Power Generating Station	None
J. L. Shiely Company		837.2	Sand and Gravel Washing	None
Swift & Company	South St. Paul	833.4	Slaughtering and Meat Packing	To South St. Paul STP - Also submerged outfall to river
Armour & Company	South St. Paul	833.0	Slaughtering and Meat Packing	To South St. Paul STP - Also submerged outfall to river

Reproduced from best available copy.

Plant or Plant Division	Location	River Mile	Nature of Wastes	Waste Treatment or Control
Northwestern Refining Co.	Below Inver Grove	830.0	Petroleum Refining	API Separator, Sulfide Stripper, Tower Oxidation for Phenols, Oxidation Pond, Hay Filters
J. L. Shiely Company		827	Sand and Gravel Washing	Settling Basin
J. L. Shiely Company		825	Sand and Gravel Washing	None
General Dynamics Corp. Liquid Carbonics Div.	Pine Bend, Minn.	824.8	Liquid Carbon Dioxide	Cooling Water and process Chemicals treated by antagonism with nitrogen product wastes, St. Paul Ammonia Products, Inc.
St. Paul Ammonia Products, Inc.	Pine Bend, Minn.	824.8	Ammonia Systhesis and fertilizer Acids, oils chromates, nitrates and ammonia	Neutralization of acids, chromates, nitrates, and ammonia, plus oil separation
Great Northern Oil Company	Pine Bend, Minn.	824.0	Oil Refinery Raw Wastes including oil, phenols, sulfides, caustics, ammonia	API Separator, Lagoons, Hay Filter, Biofilter, Activated Sludge Unit, Sulfide Stripping, Chemical Neutralization of Caustics
Northwest Cooperative Mills, Inc.	Between Pine Bend and Hastings	823.5	Phosphoric Acid and Fertilizer prod.	Lagooning of Gypsum Sludge and Recycle
Minn. Mining & Mfg. Co. Chemolite Plant	Washington County above Hastings, Minn.	819.1	Chemicals	Primary Settling and Skimming also Lagooning for domestic sewage and and phenols - phenol removal undetermined

Plant or Plant Division	Location	River Mile	Nature of Wastes	Waste Treatment or Control
H. D. Hudson Mfg. Co.	Hastings, Minn.	814	Metal Fabricating Chromic Acid Wastes	Chemical Precipitation
Northern States Power Co.	Red Wing, Minn.	789.4	Steam Power Generation	None
S. B. Foot Tanning Co.	Outside Red Wing, Minn. at Hay Creek	789.0	Leather Tanning	Fine Screens Sedimentation and Lagoons

J. M. Rademacher

The table does not include data on sewage from plant employees. In many cases, the sewage is discharged to a nearby municipal sewer, and is considered to be accounted for in the table on sources of sewage. In some cases, the industry or industries provide treatment plants for the plant sewage. In such cases, it is assumed that at least a majority of the plant employees live in surrounding sewered communities and likewise have been accounted for in the previous table on sources of sewage.

The table lists only those plants that discharge industrial wastes directly to nearby watercourses. Industries which discharge wastes to municipal sewerage systems are not included, since satisfactory disposal of these wastes is the responsibility of the municipalities involved.

The tabulation does not include information on the characteristics of the industrial wastes. Reliable recent data on volumes and constituents of many of the wastes were lacking.

Seventeen plants, which are listed on the main stem of the Mississippi River, discharge process wastes directly to the waters of the area. Principal waste constituents are oils, phenols, ammonia, oxygen-demanding materials, and suspended solids. Most of the plants have some type of waste treatment or control, but oil spills have occurred as the result of product handling and oil transfer operations from time to time. Metal fabricating wastes, including chromic acid, are discharged without treatment in the Hastings area. Hudson Manufacturing Company, Hastings, Minnesota, provides chemical treatment (Minn. WPCC Report, Jan. 20, 1964).

Twelve industries discharge wastes to the Minnesota River between Mankato, and the Mississippi River estimates on flow and specific waste constituents are not available. One food processing industry discharges wastes to the land through ridge and furrow irrigation.

Thermal Sources

The principal sources of thermal pollution at the present time in the study area are the Northern States Riverside, High Bridge and Black Dog power plants; the Northwestern Refining Company; St. Paul Ammonia Products, Inc.; Great Northern Oil Company; Minneapolis-St. Paul Sanitary District plant, and the South St. Paul sewage treatment plant.

Within the foreseeable future, the thermal load on the river will be increased with the addition of the proposed Northern States Power Plants at Red Rock and the Prairie Island Plant at Red Wing.

The latest figures available on thermal discharges are those for the months of January and August 1956, as presented in the MSSD report prepared by the Sanitary Engineering Division of the University of Minnesota. These figures are presented for the three Northern States Steam Power Plants and are as follows:

	Black Dog (Minn. River) Average Mega Btu/24 hrs.	Riverside (Miss. River) Average Mega Btu/24 hrs.	High Bridge (Miss. River) Average Mega Btu/24 hrs.	Total Mega Btu Input Rivers for Avg. 24 Hr. Period
January	31,608	20,448	18,384	70,440
August	26,352	18,144	16,560	61,056

A new unit at the Riverside plant is being added this year which increases the generating capacity from 213,000 KW to 502,300 KW and which would modify the thermal output for this station in the above tabulation. With the exception of the thermal output at the Northwestern Refining Company, which discharges up to 2.0 MGD of wastes with a temperature of 90° F. at times, the thermal outputs for the balance of the industries and the MSSD are reported to have little effect on the heat balance in the Mississippi River during the critical summer months.

Commercial Barge and Pleasure Boat Traffic

Both commercial barge traffic and pleasure boats plying this river system have a potential for discharging wastes into the waters of the area. An estimate of the magnitude of discharge would be difficult to assess.

An indication of the potential loading to the river might be gained by examining the amount of traffic passing through a specific lock at one of the Corps of Engineers' dams. For example, in 1962 at Lock and Dam No. 2 at Hastings, 1,325 commercial lockages and 2,184 pleasure boat lockages, with a total of 4,270 craft, were reported. With an estimated average crew of 6 to 10 on a commercial tow and an average occupancy of 3 per pleasure craft, the total through the lock may have ranged up to 20,000 persons during the navigation season.

Although pollutional discharges from this source are generally distributed over wide areas, localized effects cannot be discounted, particularly in the marine and terminal areas. The sewage, combined with other discharges such as bilge pumpages, garbage and litter, present an increasing problem.

Agricultural

The waters of the Mississippi River within the area covered by this report are bordered by approximately 200 miles of shore line, much of which is devoted to parks, forests, and improved agricultural lands. Steep bluffs are a predominant feature of this area, conducive to high rates of run-off, which may conceivably contain fractions of the 55,000 pesticide products currently registered with the Federal Government. Tentative studies have been initiated in the summer of 1963 by the Minnesota Water Pollution Control Commission to investigate this problem in the surface waters in Minnesota.

In addition to the above possibility, the improved

Reproduced from best available copy.

farm lands are a potential source of the nutrients being contributed to the waters. No work is in evidence relative to the extent of sources or effects of nutrient levels within the area.

Bulk Storage Areas, Pipelines and Barges

One good that results from accidental losses of valuable commodities is the public awareness and concern it creates. Major oil spills on the Minnesota River in the winter of 1962 were of paramount importance in the recent delegation of authority to the Minnesota Water Pollution Control Commission by the 1963 legislature to prohibit storage without proper safeguards of any liquids which could cause pollution of waters (Sec. 5, Subd. 3(2) of Laws of 1963, Chapter 874).

While above-ground storage facilities create a potential hazard to nearby watercourses, they are by no means the only potential problem. Throughout the country in recent times such disasters as the sinking of barges containing items from chlorine to rye have occurred; oil transfer lines have ruptured during unloading operations; and heating coils within tanks have separated causing damaging substances to be discharged to the watercourse.

These are all items which can have far-reaching effects and for which control is difficult. Another problem is the inadequate diking of waste lagoons adjacent to water courses subject to periodic flooding.

Within the area described here, there exist some 33 barge terminals and barge cleaning operations and bulk storage facilities. To this potential must be added the possible hazard generated by the hundreds of tons of gasoline and other petroleum products transported by barges during the year. The Corps of Engineers estimate that possibly 5 percent of the barges in this traffic would develop as "leakers."

(Table 7 is as follows:)

53amr

TABLE 7

INDUSTRIES HAVING POLLUTION POTENTIAL FROM PRODUCT SPILLAGE, BUT HAVING NO DIRECT EFFLUENT DISCHARGE

PLANT OR PLANT DIVISION	LOCATION	RIVER MILE
Mississippi River		
Western Oil & Fuel Company Terminal	Minneapolis	852.9
Municipal Coal Terminal	Minneapolis	852.8
Pure Oil Company Terminal	Minneapolis	852.7
Municipal Barge Terminal	Minneapolis	852.5
Phillips Petroleum Company Terminal	Minneapolis	852.4
Great Northern Oil Company	Minneapolis	852.0
The Texas Company Terminal	St. Paul	842.5
Socony Mobil Oil Company Terminal	St. Paul	842.3
Shell Oil Company Terminal	St. Paul	842.2
Archer Daniels Midland Terminal Company Terminal	St. Paul	841.7
Petco Oil Company Terminal	St. Paul	841.6
Clark Oil Company Terminal	St. Paul	841.5
Northern States Power Company Coal Terminal	St. Paul	840.5
Minnesota Harbor Service Barge Cleaning Facility	St. Paul	840.4
W. H. Barber Company Terminal	St. Paul	840.3

PLANT OR PLANT DIVISION	LOCATION	RIVER MILE
St. Paul Grain Terminal	St. Paul	840.0
American Mineral Spirits Company Terminal	St. Paul	839.4
Fluid Storage Inc. Terminal	St. Paul	837.4
Walsh Grain Company Terminal	St. Paul	837.4
Municipal Barge Terminal	St. Paul	837.3
Continental Grain Company Terminal	St. Paul	836.9
Northwest Refining Company Terminal	St. Paul Park	830.0
Northwest Refining Company Terminal	Hastings, Minn.	814.6
Hermanson Coal Dock	Prescott, Wis.	811.0
Municipal Barge Terminal	Red Wing, Minn.	791.2
Central Soya Terminal	Red Wing, Minn.	791.0
Northern States Power Company Coal Terminal	Red Wing, Minn.	789.4
Minnesota River		
Continental Grain Terminal Co.	Between Savage & Minneapolis	14.7
Central Soya Company Terminal	Between Savage & Minneapolis	14.6
Richards Oil Company Terminal	Savage, Minn.	14.5
(Port) Cargill Inc. Terminal	Savage, Minn.	13.9
Northern States Power Company Blackdog Plant Coal Dock	Minneapolis	8.4
Barge Cleaning Facilities	Minneapolis	8.0

Other Pollution Sources

In addition to the major rivers within the area covered by this report, there are at least 15 small tributary streams contributing to the overall water quality picture. Slight as these sources seem, it must be realized that some of these small watersheds incorporate industrial and urban areas while others accept drainage from cultivated farm lands, small settlements and individual home sites.

Data have been obtained on some of these tributaries relative to the total coliform densities, DO, and BOD. These data have been obtained by the Minnesota Department of Health prior to 1962 with more detailed studies being currently performed. Some of those tributaries and pertinent data are as follows:

Rum River: All of the sources of direct discharge of raw sewage have provided or are making progress toward construction of treatment facilities. Total coliform densities averaged 3,800 MPN/100 ml for the 44 determinations made.

Cook Creek: This creek drains a mainly flat, sandy agricultural land which is sparsely populated except for the southern part southeast of Anoka which contains extensive suburban residential areas. Samples collected since 1960 indicate high DO, low BOD, and a total coliform average of 6,060 MPN/100 ml for 13 determinations.

Rice Creek: This stream drains the area northeast of Fridley and at present receives no discharge from a public sewerage system. However, some treated industrial wastes do enter the creek. Thirteen determinations show a high average DO, a BOD of 7.4 mg/l and a coliform average density of 3,425 MPN/100 ml.

Shingle Creek: This creek drains a mainly rural area northwest of north Minneapolis. There are at present no major waste-producing industries in the area nor are there any surface discharges from municipal sewerage systems. Eleven determinations indicate average values of 9.7 mg/l for DO, 4.2 mg/l for BOD, and total coliform average density of 509,800 MPN/100 ml.

Bassetts Creek: This creek drains an area west of Minneapolis largely devoted to residential development and farming. The creek is considered potentially valuable for recreational use because of growing residential areas near it. Thirteen samples taken one mile above the mouth show averages of 866,900 MPN/100 ml for coliforms, a DO average of 6.6 mg/1, and BOD of 12.7 mg/1.

Minnehaha Creek: This stream serves as the outlet of Lake Minnetonka and also drains an extensive area between the outlet of the lake and the Mississippi River. Eight determinations indicate a coliform group average of 22,400 MPN/100 ml, with a DO of 9.0 mg/1 and a BOD of 5.1 mg/1.

Within the Minneapolis-St. Paul metropolitan area itself, an estimated 342,000 people are at present dependent on individual home sewage disposal facilities, consisting primarily of a septic tank with a subsurface drain tile field or cesspool for disposal of the tank effluent. The great number of these installations in close proximity to one another are a threat to the quality of the underground waters.

In addition, many commercial establishments, suburban shopping plazas, trailer camps, motels, restaurants, etc., are located throughout the area and many discharge treated and untreated wastes into the watercourses leading to the Mississippi and Minnesota Rivers. The effect on the bacteriological quality in particular should be considered as having significance.

The U. S. Army Corps of Engineers in maintaining channel depths in the Mississippi and Minnesota Rivers have established a year-around program of dredging and spoil deposition. This program is of two types, deposition by hydraulic methods in spoil areas along the shore and by barges to downstream off-channel areas.

EFFECTS ON WATER QUALITY AND WATER USES

With knowledge of the sources of wastes in the conference area as well as information on such water quality indices as coliform bacteria, BOD, dissolved oxygen, pH, temperature, suspended solids, etc., an assessment may be made of the effects on the existing and potential uses of the waters in the area. The following section outlines these effects insofar as information is available for a reasonable evaluation.

COLIFORM BACTERIA

Minnesota's basic guide for bathing or swimming waters has a limiting value for coliform density, although this may vary depending upon the results of a sanitary survey. The upper limit is a "most probable number" of 1,000 coliforms per 100 ml as determined by the arithmetic average of coliform counts during any one month of the recreation season.

According to many State and interstate pollution control agencies, waters used for swimming and water contact sports should not average more than 1,000 MPN/100 ml total coliform bacteria and those used for general recreation should not average more than 5,000 MPN/100 ml.

For example, the Ohio River Valley Water Sanitation Commission, representing eight States, and the Engineering Section of the Missouri Basin Health Council, representing ten States, have adopted the following guide:

> "For bathing or swimming waters, monthly arithmetical average 'most probable number' of coliform organisms should not exceed 1,000 per 100 ml during any month of the recreation season; nor exceed this number in more than 20 percent of the samples examined during any such month; nor exceed 2,400 per 100 ml on any day. For non-bathing or non-swimming waters, the monthly arithmetical average 'most probable number' of coliform organisms should not exceed 5,000 per 100 ml in any month of the recreational season, nor should exceed this number

in more than 20 percent of the samples
examined during any such month."

In this report, coliform concentration data, supplied by the Minneapolis-St. Paul Sanitary District for 1962, were used. The information was reported in terms of coliforms per cubic centimeter, using the presumptive test only. Since most standards for quality with respect to this indice are reported in terms of coliforms per 100 ml, the data was adjusted to this format.

In the Mississippi River above the Minnesota River, the monthly arithmetical average coliform levels near the intake for the Minneapolis Water Plant (River Mile 858.5) ranged from 1,100 in December to 13,000 coliforms/100 ml in May. The high individual count was reported as 22,000 coliforms/100 ml and occurred on May 24. At the Fort Snelling Bridge (River Mile 845.5) the monthly average coliform concentrations ranged from 7,000 coliforms/100 ml for June to 810,000 coliforms/100 ml in September. The high individual count was reported as 1,600,000 coliforms/100 ml on September 19. The high coliform levels in this upper stretch of the Mississippi River may be attributed to storm water overflow contributions, land run-off, and contributions from such tributaries as Minnehaha Creek, Bassetts Creek, Shingle Creek, and Rice Creek.

J. M. Rademacher

The Minnesota River (River Mile 845.4) at its mouth had a monthly average range of 940 coliforms/100 ml in February to 43,000 coliforms per 100 ml in September, with an individual high of 79,000 coliforms per 100 ml reported on September 6, 1962. Downriver, immediately above the MSSD plant outfall, the monthly average coliform levels ranged from 11,000 coliforms/100 ml in June to 62,000 coliforms/100 ml in August. The individual high during the recreation season was 160,000 coliforms per 100 ml. Again, the relatively high levels may be attributed to the effects of the metropolitan complex through which the river passes.

Below the MSSD outfall the sampling station data describe the very high coliform levels contributed by that source and the South St. Paul Treatment Plant. At the Inver Grove Bridge (River Mile 830.3), some six miles below the MSSD plant and two miles below the South St. Paul Plant, the monthly average coliform levels ranged from 100,000 coliforms per 100 ml in April to 2,800,000 coliforms/100 ml in October, with an individual high of 4,900,000 coliforms/100 ml on September 26. Almost eight miles further downstream at Grey Cloud Landing (River Mile 822.5) the monthly average coliform levels ranged from 110,000 coliforms/100 ml in January to 1,700,000 coliforms/100 ml for August, with a high of 3,500,000 coliforms/100 ml reported during May. Between June and October the individual high was 2,400,000 coliforms/100 ml on August 23. At the Hastings Highway Bridge (River Mile 813.9) the coliform range was 12,000 coliforms/100 ml in March to 560,000 coliforms/100 ml in July and August. The individual high at this station was 2,400,000 coliforms/100 ml on August 1. The coliform levels in this stretch of the river reflect the heavy input at the two major sewage treatment plants and the "die-away" rate to Hastings. The St. Croix River appears to be in good condition on the basis of coliform levels. The monthly average coliform concentrations for this river ranged from 100 coliforms/100 ml in October to 620 coliforms/100 ml during June. The individual high reported was 1,700 coliforms/100 ml on July 10, 1962.

In the interstate reach of the Mississippi River below Hastings, Minnesota, and Prescott, Wisconsin, significant levels of coliform concentrations are reported. At Prescott Island (River Mile 810.2) the monthly average range was 22,000 coliforms/100 ml in October to 360,000 coliforms/100 ml in August, with an individual high of 920,000 coliforms per 100 ml reported in August. At Diamond Bluff (River Mile 800.5) the monthly average range was 4,900 coliforms/100 ml in March to 160,000 coliforms/100 ml in July, with a high of 350,000 coliforms/100 ml reported on June 20. Above Lock and Dam No. 3 (River Mile 796.9) the monthly average range reported was 5,200 coliforms/100 ml for March to 63,000 coliforms/100 ml for the months of November and December. The individual high occurred during December and was reported at 130,000 coliforms/100 ml. During the summer months the monthly average range was 21,000 to 36,000 coliforms/100 ml with only one sample having a count less than 5,000 coliforms/100 ml (4,900/100 ml).

Continuing downstream, at Red Wing, Minnesota (River Mile 792.0), the monthly average coliform range was 3,200 coliforms/100 ml for February to 64,000 coliforms/100 ml for November. The high point was reached on both August 14 and November 14 at 79,000 coliforms/100 ml.

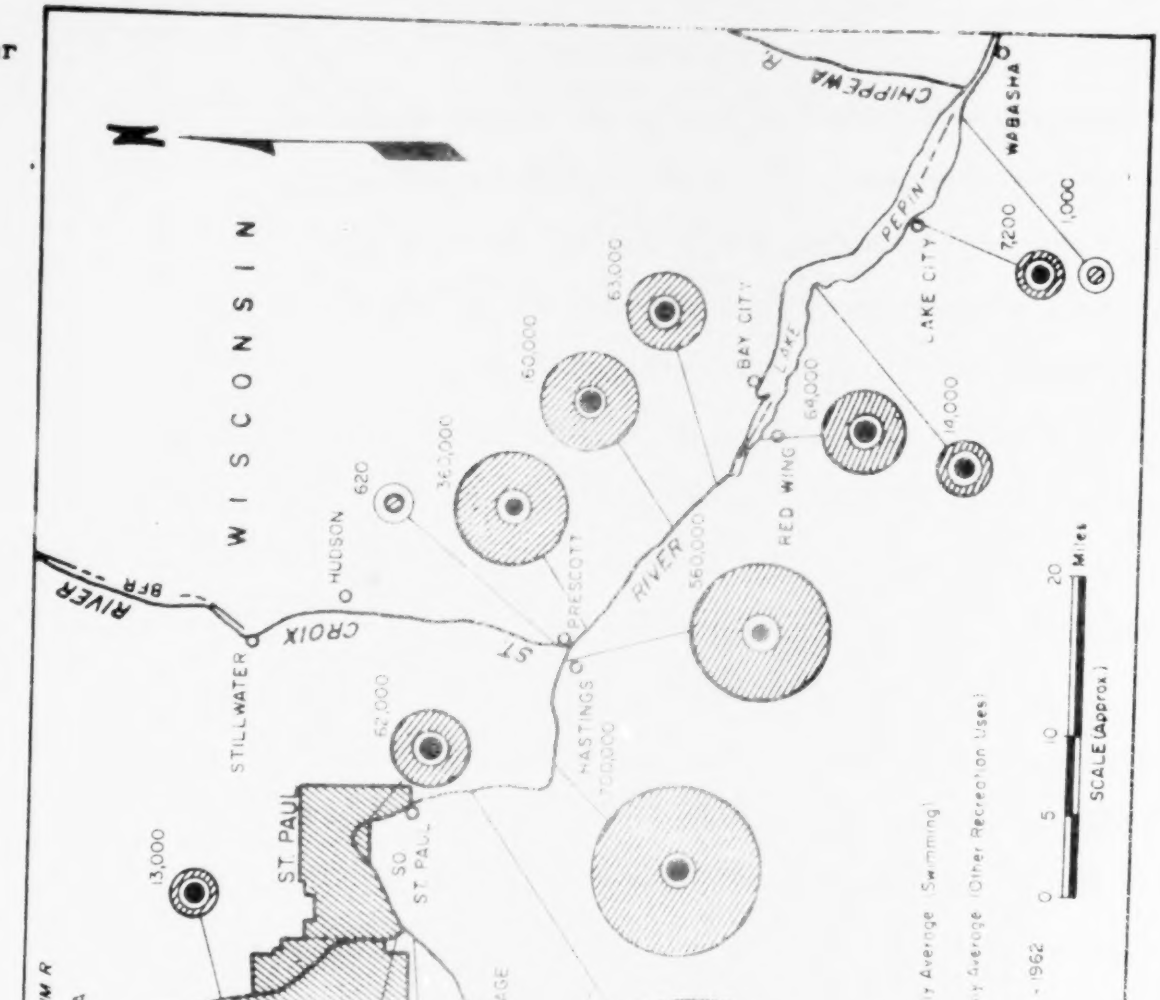
In Lake Pepin the monthly average coliform concentrations at Frontenac (River Mile 779.0) ranged from 490 coliforms/100 ml (one sample) for March to 14,000 coliforms/100 ml in November (high individual sample - 24,000 coliforms/100 ml on November 14). High counts of 13,000 and 14,000 coliforms/100 ml were recorded during July of this period. Opposite Lake City, Minnesota (River Mile 772.8) the range was 170 coliforms/100 ml for March (one sample and 7,200 coliforms/100 ml for November. The high individual count was 11,000 coliforms/100 ml on November 14.

All nine samples collected during the summer months of June through September 1962 had coliform densities less than 5,000 coliforms/100 ml and six of the nine had densities greater than 1,000 MPN/100 ml. At the outlet to Lake Pepin (River Mile 764.9) the range of coliforms reflected relatively clean water with concentrations reported at 45 coliforms/100 ml in December and 1,000 coliforms/100 ml in November. The high individual count occurred in November at 1,300 coliforms/100 ml.

It appears from the collected data for 1962 and other years that high concentration of coliform bacteria are present in the interstate reach of the Mississippi River and in Lake Pepin, although the bacterial quality at the lake's outlet is good. A pictorial representation (Figure 6) relates the maximum coliform levels to the standards for swimming and other recreational uses as described earlier.

(Figure 6 is as follows:)

65amr


N
MINNESOTA
WISCONSIN
MISSISSIPPI
RUM R
ANOKA
MINNEAPOLIS
ST. PAUL
SO. ST. PAUL
STILLWATER
ST. CROIX RIVER
BFR
HUDSON
PRESCOTT
HASTINGS
RED WING
BAY CITY
LAKE PEPIN
LAKE CITY
WABASHA
CHIPPEWA R.
MINNESOTA RIVER
CHASKA
SHAKOPEE
SAVAGE
810,000
43,000
13,000
2,800,000
700,000
62,000
560,000
360,000
620
160,000
63,000
64,000
14,000
7,200
1,000
LEGEND—
BFR : Boundary Follows River
● = 1,000 MPN/100 ml Monthly Average (Swimming)
○ = 5,000 MPN/100 ml Monthly Average (Other Recreation Uses)
Maximum Monthly Average - 1962 MPN/100 ml
SCALE (Approx)
0 5 10 20 Miles

COLIFORM CONCENTRATIONS
TWIN CITIES — UPPER
MISSISSIPPI RIVER AREA

US DEPT OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V CHICAGO, ILLINOIS

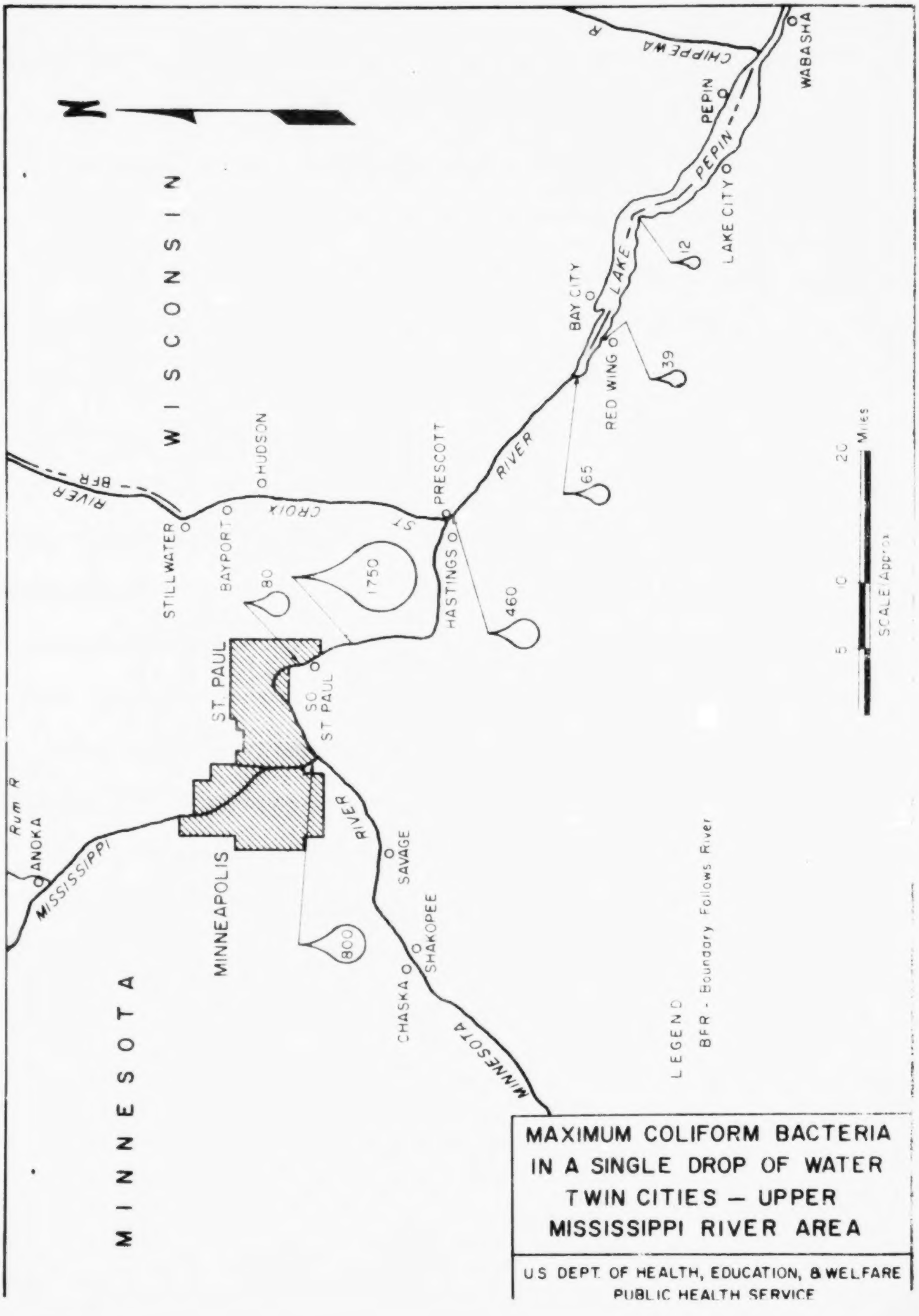
FIGURE 6

J. M. Rademacher

Using a maximum value of 1,600,000 coliforms/ 100 ml in the stretch of the Mississippi River above its juncture with the Minnesota River, anyone ingesting a single drop of water with this bacterial density would swallow about 800 sewage bacteria. At the station above the MSSD outfall, each drop would have 80 sewage bacteria during the maximum contration of 160,000 coliforms per 100 ml. Below the MSSD plant at Grey Cloud landing each drop swallowed could contain as many as 1,750 sewage bacteria. In the interstate section of the river with counts as high as 130,000 coliforms/100 ml at Lock and Dam No. 3, 97,000 coliforms/100 ml at Red Wing, and 24,000 at Frontenac, each drop of water sprayed into a boater's mouth or swallowed by a swimmer or water skier would have the possibility of 65, 39, and 12 sewage bacteria being ingested, respectively. Figure 7 reflects these possibilities.

(Figure 7 is as follows:)

67amr


N
WISCONSIN
MINNESOTA
CHIPPEWA R
WABASHA
PEPIN
LAKE PEPIN
LAKE CITY
12
BAY CITY
RED WING
39
65
RIVER
PRESCOTT
HUDSON
ST CROIX
RIVER BFR
STILLWATER
BAYPORT
1750
80
HASTINGS
460
ST PAUL
SO ST PAUL
Rum R
ANOKA
MISSISSIPPI
MINNEAPOLIS
RIVER
SAVAGE
800
SHAKOPEE
CHASKA
MINNESOTA
LEGEND
BFR - Boundary Follows River
5
0
10
20
Miles
SCALE Approx

MAXIMUM COLIFORM BACTERIA
IN A SINGLE DROP OF WATER
TWIN CITIES — UPPER
MISSISSIPPI RIVER AREA

U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE

Reproduced from best available copy.

J. M. Rademacher

It might be pointed out that these presumptive coliform measurements are total counts and include all types, including non-fecal varieties. Mr. H. F. Clark, Research Branch Biologist, Division of Water Supply and Pollution Control, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio, has reported on the efficacy of differential testing for fecal coliforms and fecal streptococci. On the basis of a 96 percent correlation as to the source of specific coliforms from the gut of warm-blooded animals and a better than 99 percent correlation of fecal organisms with a fecal source, and the non-fecal organisms with the absence of any fecal source, any definitive stream survey should include three test procedures: The total coliform test, the fecal coliform test as a supplement to the total coliform test to be able to pinpoint the coliforms that come from soil erosion, and the fecal streptococci test with a sufficient number of species identifications performed in certain specified samplings on the strain type or species type of streptococci to be able to indicate a possible source from which those streptococci were derived.

Included as a part of this report in the Appendix is a statement prepared by Mr. Clark concerning the "Bacteriological Examination of Stream Samples." The Minnesota

Water Pollution Control Commission reports that differential testing for coliforms has been initiated during the past year as part of its water quality evaluation program.

Although commendable progress has been made in sewage treatment in the entire Twin Cities Area, including the significant Minnesota and St. Croix Rivers, further improvements are needed to minimize the hazards of excessive bacterial contamination. The more serious problems indicated by available data are the high densities throughout much of the main stem of the Mississippi River and the Minnesota River which constitute a hazard to recreational uses, including sport and commercial fishermen. Major needs for improvement include measures for reducing the effects of discharges of raw sewage from diversion structures on the collection system throughout the metropolitan area, more adequate disinfection at the Minneapolis-St. Paul Sanitary District treatment plant and the South St. Paul treatment plant, and the identification and control of other bacterial contributions throughout the area.

FIVE-DAY BIOCHEMICAL OXYGEN DEMAND

The studies conducted by the Minnesota Department of Health in 1960-61 and the definitive analysis of MSSD data by Professor George J. Schroepfer of the University of

Minnesota outline the degrading effects of the Biochemical Oxygen Demand (five-day) on the Mississippi River as it passes through the Twin Cities metropolitan area to its juncture with the St. Croix River.

Using August 1962 five-day BOD data and mean river flows supplied by the MSSD as an example, the average loading for that critical month increased from 59,900 pounds/day at Fridley above the Twin Cities to 63,000 pounds at the Fort Snelling Bridge above the Mississippi's confluence with the Minnesota River; to 98,000 pounds at the Robert Street Bridge, and 101,500 pounds immediately above the MSSD outfall.

The Minnesota River was a significant contributor to the overall five-day BOD loading of this stretch of the river with an average discharge of 26,100 pounds. Dissolved oxygen levels on the Minnesota River ranged from 0.4 mg/1 to 20 mg/1, at the County Road 18 Bridge below Shakopee, Minnesota. Below the MSSD outfall the BOD loading averaged 305,000 pounds at River Mile 835.0 above South St. Paul. This high loading dropped rapidly to 234,000 pounds at the Inver Grove Bridge some five miles downstream and thence to 148,000 pounds at the Hastings Highway Bridge. The calculated average five-day BOD loading on the Mississippi River below its confluence with the St. Croix River for

August 1962 was 139,500 pounds. The high rate of early deoxygenation in the river stretch immediately below the MSSD plant and South St. Paul reported by Professor Schroepfer in his studies is apparent.

The total five-day BOD from all sources of sewage is estimated to be approximately 228,180 pounds per day. Of this 225,940 pounds per day, or 99.1 percent, were discharged directly to the Mississippi River. The MSSD plant accounted for 209,000 pounds per day, or 91.6 percent. The South St. Paul Treatment Plant discharged an estimated 14,500 pounds per day, or 6.3 percent.

(Adjust figures to reflect the increased load from South St. Paul:

From 14,500 pounds to 27,000 pounds
From 228,180 pounds to 245,430 pounds
From 225,940 pounds to 238,190 pounds.)

The survey by the Minnesota Department of Health in 1960-61 reported a virtual total depletion of dissolved oxygen for a 7.5 mile stretch of the river from below the MSSD outfall to the vicinity of the Great Northern Oil Company barge slip. Data from the MSSD river sampling program for that period confirmed these conditions.

The pending expansion program to secondary treatment for the MSSD plant has been based principally on

DO levels to be maintained in the Hastings Pool of the Mississippi River under varying flow conditions originally established to meet the requirements of the Minnesota State Board of Health in 1934. With some modification these have been interpreted by the MSSD to require: (a) Maintenance of 2 ppm of DO at mean monthly discharges exceeded 90 percent of the time during the critical months of February and August; (b) maintenance of one ppm of DO at mean monthly discharges exceeded 99 percent of the time during the critical months of February and August; and (c) maintenance of a trace of DO during periods of minimum five-day discharges exceeded 99 percent of the time during the critical months of February and August. Additionally, four ppm of dissolved oxygen would be maintained during periods of minimum five-day discharges exceeded 99 percent of the time during the critical months of February and August in the Mississippi River both above its confluence with the Minnesota River and below its confluence with the St. Croix River. These objectives agree with the stream standards adopted by the Minnesota Water Pollution Control Commission in March 1963.

SUSPENDED SOLIDS AND SLUDGE DEPOSITS

J. M. Rademacher

The physical and nutritional changes effected by organic sludges of certain industrial or sewage origin may result in the formation of zones in a stream, characterized by different organism associations. A clean water zone may have a bottom composed of small and large stones. In this type of environment are found many different kinds of bottom-fish-food organisms, plankton, and fish. Fish nesting areas are numerous. The typical association of clean-water-dwelling animal species are immature caddisflies, stoneflies, mayflies, hellgrammites, gill-breathing snails, and pearl-button clams. Small-mouth black bass, sunfish, and various minnows are found. Numerous kinds of plankton are present. Thus in the unpolluted zone there is a great variety of animals and plants, but because of predation and competition for food and living space these are represented by few individuals.

In the zone of recent pollution, floating solids that become settleable blanket out light penetration, and, on moving into the zone of active decomposition, settle to form sludge deposits over the entire bottom. Turbidities here are high. Only a few kinds of animals and plants can survive on the soft, shifting blanket of sludge. Such organisms, isolated from many predators, form huge populations of individuals. Solids, in settling, flocculate floating small animals and plants out of water; thus these are scarce. The few animal forms that are adjusted to living in a sludge substrate are sludgeworms, some kinds of bloodworms, water sowbugs, certain snails, and various leeches. Fish are absent or are scarce and prefer to form their nests elsewhere. Flowering water plants are absent, not being able to root in sludge deposits. Most algae are extremely scarce, being represented by dominating blue-greens that form gelatinous slimy coverings over the sludge in shallow marginal water.

Bottom deposit investigations are reported in the Minnesota Department of Health's "Investigation of the Mississippi River from the Mouth of the Rum River to the Mouth of tne St. Croix River" (1960-1961) and the University of Minnesota's report to the MSSD, "Pollution and Recovery Characteristics of the Mississippi River," Volume I, Part Three, September 1961. Sludge deposits are common for the entire distance of 21.2 miles from the MSSD plant outfall to the Hastings Dam.

These deposits were reported as ranging up to 4.5 feet in depth and varying in consistency from a thick, black, sticky mass to a sand-sludge mixture. The most active area in terms of sludge decomposition, as would be expected, was in the four miles below the MSSD outfall.

J. M. Rademacher

These conditions originally surveyed in 1959 generally agreed with conditions found by the Department of Health in their 1961 investigations. During these investigations, the river was reported as being highly colored with solids characteristic of packing house wastes in particular.

Reports on the biology of the river in terms of a qualitative evaluation of the aquatic environment were briefly described in the MSSD report for the section immediately above the MSSD outfall, the center of the river approximately 1.5 miles downstream from the MSSD outfall, and the west side of the river some three and one-half miles downstream from the MSSD outfall.

The presence of tubifex worms (a sludge worm) and various forms of small shell life were the only forms of aquatic flora and fauna reported.

Information on the biological character of the interstate waters of the Mississippi River as well as the Minnesota River is limited to the recent oil spill investigations by the scientists from the Robert A. Taft Sanitary Engineering Center. The effects of these spills are well documented with significant shore and bottom areas blanketed with the polymerized soya oil in the upper sections of Lake Pepin, in the Mississippi River, and in the Minnesota River as far back as Mankato, Minnesota.

Reproduced from best available copy.

A continuing assessment of the biological character of the river sludge deposits is needed for the entire river stretch under consideration. Identification of the industrial sources of both organic and inorganic solids should also be made, because of the lack of recent data in some cases.

OIL

It is difficult and impractical to measure oil in large streams and no quantitative data on oil in the waters of the Mississippi River are available. Evaluation of the oil pollution problem can be based only on reports of visual observations and on reported evidences of the effects of pollution.

One dramatic effect of oil pollution is its killing power on ducks. Death can come to ducks in several ways. The oil coats their feathers and they become waterlogged, lose their ability to fly, and may drown. Oil also breaks down the feathers' insulating capacity, and the ducks may freeze to death. Ducks covered with oil do not eat normally and may starve to death. They attempt to preen oil off their feathers, and they ingest toxic materials that cause their death.

This drama was played out during the winter of 1962-1963 as the result of two massive oil spills on the Minnesota River. An estimated 1,000,000 gallons of petroleum cutters oil from the Richards Oil Company at Savage, Minnesota (River Mile 12.0) and an estimated 2,500,000 gallons of crude soy bean oil from the Honeymead Plant at Mankato, Minnesota (River Mile 101), combined to coat the Minnesota and the Mississippi River from Mankata downstream into Lake Pepin for a distance of about 130 miles. The oil moved with the ice break-up in late March and was coincident with the northward migration of the many thousands of ducks which use the Mississippi flyway. Approximately 3,000 birds were found dead or dying and it was estimated that up to 10,000 ducks met untimely deaths as the result of this oily trap.

The polymerization of the soy oil resulted in the formation of spongy "blankets," or "ropes," which were either deposited on the beds of the rivers and lakes or were blown onto the shores. The beach at Bay City, Wisconsin, in particular is still feeling the effects of this pollution.

The problem of accidental oil spills is a continuing one and major steps must be taken from both a legal and preventative control standpoint. Recent progress in this direction has been exemplified in the action of Governor Rolvaag and the Minnesota legislature in supplying legal tools to the Minnesota Water Pollution Control Commission with which to work on a program for control of spills.

ALGAE

Wastes containing nitrogen and phosphorus (fertilizers) pollute our waters and contribute to the increase of certain organism populations. Organism populations reach such magnitudes that water uses are interfered with and nuisances are created. Organisms that respond to such nutrients are certain floating and attached algae and rooted aquatic plants. If streams, lakes, and man-made impoundments continue to become enriched with wastes of industrial, municipal, and agricultural origin, biological nuisance problems that exist today will become intensified in many areas. Other areas that do not have them now can certainly expect them.

Inorganic and organic nutrients containing nitrogen and phosphorus are among the major factors that contribute to plant abundance including nuisance algal blooms. In modern waste treatment practices, dissolved inorganic or mineral constituents of municipal sewage and industrial wastes are removed only incidentally by sedimentation and oxidation. Also, certain organic materials are broken down with treatment to liberate inorganic nitrogen and phosphorus, thus making them more available as fertilizers for plant growth. Treatment plant effluents may actually contain more readily available nutritional (fertilizer) substrates than are found in raw sewage effluents.

It has been reported that if assets of inorganic nitrogen and phosphorus exceed 0.30 mg/l and 0.01 mg/l, respectively, in a lake at the start of the active growing season, a season with nuisance blooms could follow. This does not limit the possibility of algal growth to these nutrients alone, since many other factors, no doubt, contribute to their development.

Within the intrastate sections of the Mississippi River above Hastings, Minnesota, the phosphorus concentrations increased from an average of 0.097 mg/l in the upper section to 0.18 mg/l in the middle section, and 0.48 mg/l in the lower section. Total nitrogen levels within the same ranges averaged 0.70, 0.80, and 3.4 mg/l, respectively. As reported in the State of Minnesota 1960-1961 survey, each of these water quality indices increased fourfold as the river passed through the metropolitan complex.

Downstream, the Public Health Service's National Water Quality Network Station at the Red Wing Lock and Dam reported phosphate concentrations ranging from 0.5 mg/1 to 0.8 mg/1 during July and August 1960, and 0.2 mg/1 to 0.4 mg/1 during August and September 1961. Total nitrogen was not reported. However, ammonia nitrogen levels ranged from 0.0 mg/1 to 0.2 mg/1 in 1960 and 0.3 mg/1 to 1.0 mg/1 in 1961 for the same periods.

The present and future effects on the total water resource of the area should be determined with respect to these important water quality indices which may contribute or trigger the growth of nuisance blooms of algae.

TASTES AND ODORS

Over the years, a continuing complaint reaching the Minnesota Department of Conservation has been the off-tastes of fish caught in various stretches of the Mississippi River in the Twin Cities area. These reports have mainly concerned fish taken in the reach above the Hastings Dam, with occasional complaints coming from as far south as Red Wing and Lake Pepin.

A wide variety of substances has been suggested as agents producing tastes and odors in water and off-flavor in fish flesh. The better known compounds include phenolics, mercaptans, and other complex aromatic organic substances. Not to be dismissed, though, is the taste and odor-producing capability of many algal forms.

Within the area under study and particularly in the reach above the Hastings Dam, phenol concentrations of 49 ppb in the river were reported at River Mil 829.4. A phenol concentration of 65 ppb in an outfall creek was also reported by the Minnesota Department of Health at River Mile 818.1. The average concentration of phenols in the stretch of the river from River Mile 830.3 to River Mile 813.6 was reported as 24 ppb in the State of Minnesota's report of survey for 1960-1961. No information on phenol levels is available for the interstate section of the Mississippi River below Prescott, Wisconsin.

By way of comparison, the International Joint Commission's recommended standard for phenols or phenol equivalents in the international waters of the Detroit River limit the concentration to a monthly average of 2 ppb, with a maximum not to exceed 5.0 ppb after initial dilution of the wastes. A similar standard has been recommended in the Bi-State Agency 1954 Report to the States of Missouri and Illinois for the Mississippi River in the St. Louis Metropolitan Area. The phenol concentration limits set in the classification program of the Minnesota Water Pollution Control Commission range from 10 ppb above the MSSD outfall to 100 ppb in the river stretch below the MSSD plant to the Mississippi River's confluence with the St. Croix River.

Evaluations of taste and odor problems in the Mississippi River in the Twin Cities area have been attempted in the past, but no formal report was developed and the results were apparently inconclusive.

The need for an intensive review of this water quality problem is necessary in the development of an overall water quality control program.

PESTICIDES

Recent controversies associated with the programs for the control of the fire ant, the spruce bud worm, the gypsy moth, other forest insects, and extensive pesticidal application on food crops, have focused attention on the problems of those interested in the preservation of the aquatic habitat. Most pesticides are toxic to aquatic life; some are highly toxic (e.g., 0.6 pounds of Endrin in 120 million gallons of water will kill bluegill sunfish); some accumulate in the fat and flesh of organisms and in bottom muds. Their use has resulted in the killing of fish and waterfowl, as well as invertebrates such as crabs, crayfish, and aquatic insects that are important in food chains.

Use of pesticides by the aquatic biologist at times has been an important aspect of lake and stream management; such use has been directed toward the control of nuisance midge, mayfly, and mosquito populations, undesirable algae and aquatic weed growths, the sea lampreys, and stunted or undesirable fish populations. Pesticides exhibit tremendous variation in their impact upon the aquatic community; great variation is also shown in the susceptibility of the many kinds of aquatic invertebrates important in fish and waterfowl food chains within that community. Various additives such as solvents, wetting agents, and dilutents tend to decrease the hazards to birds and animals and increase the toxicity to aquatic organisms. The kinds of animals associated with the pesticide-treated habitat, and their activities within the treated area, are important factors in governing the hazards of the application. The season of the year greatly influences the effect of the pesticide because of the migration, hibernation, and life cycle of the aquatic organism, waterfowl, and other wildlife. The recovery of an affected area depends upon many factors, among which are the proximity of similar habitats, the migratory tendency and range of the animals, and the number of generations per year.

Pesticides must be considered individually rather than collectively and toxicity problems must be balanced between the beneficial and harmful effects of a proposed application upon the aquatic environment. To do this necessitates a knowledge of the toxicity and associated hazards of the control agent. Usage must be governed by rigid controls, and adequate safeguards must be installed against "careless use," which has so often been the chief cause of unwarranted aquatic mortalities. Estimates on total poundage of the various pesticides, weedicides and other exotic control compounds used in the Twin Cities area are not available. Effects on water quality in the Minnesota, Mississippi and St. Croix Rivers from these agents have yet to be assessed.

TEMPERATURE

The pollutional effect of temperature increases on aquatic life in natural waters has long been overlooked or ignored. A subtle effect is illustrated by the decrease in solubility of oxygen in fresh water. Under a pressure of 760 mm of mercury at sea level and 32° F, it is 14.62 ppm; at 68° F it is 9.17 ppm, and at 86° F it is

7.63 ppm. Thus, heat alone can deny aquatic life the necessary oxygen reserves. Where a putrescible waste creates a high biochemical oxygen demand and takes additional oxygen from the stream, increased temperatures are dangerous as they may be related to the depletion of dissolved oxygen to suffocating levels for aquatic life.

Another subtle effect of temperature increase is reflected, on occasion, in the increased toxicity of certain chemicals to aquatic forms. For example, high temperatures increase the toxicity of rotenone to fish. Brown trout die much more rapidly at 70° F than they do at 55° F, the time being about 15 and 70 minutes, respectively, with a 0.40 ppm dosage. With dosages of 0.20 ppm they die in about 22 minutes at 70° F, and in 100 minutes at 55° F.

In field investigations involving industrial wastes on large streams, it may be difficult to relate detrimental effects of temperature, i. e., heat pollution, to specific aquatic organisms. High temperatures may adversely affect the over-all biota by eliminating many organisms, but in doing so, allow a few, such as certain heat-resistant blue-green, scum-forming nuisance algae, to become dominant.

Gross limits of temperature to which most warm-water fish are subjected in natural bodies of water are somewhere between 32° F to 95° F. The standards of water quality adopted by the Minnesota Water Pollution Commission relative to thermal discharge state that between the Rum River and the Minneapolis-St. Paul Sanitary District Plant the discharge of wastes shall be controlled so that the heat content of such discharge does not raise the river temperature above 93° F at any point after reasonable dilution. In the stretch between the MSSD plant and the mouth of the St. Croix River, the standard states that the discharge shall be controlled so that the heat content of the wastes will not raise the temperature of the river high enough to be directly injurious to fish life, or substantially interfere with or affect adversely other established uses.

Current knowledge does not permit a precise statement regarding the effects of varying temperature levels on the over-all biota of a stream. In general, in most temperate-zone streams of low gradient, large reaches should not exceed 86° F for prolonged periods; headwater streams will probably have an upper limit of from 72° F to 77° F for extended periods of time. Additional research is likely to lower rather than raise these limits.

Temperature effects resulting from both present and future thermal loads on the Mississippi and Minnesota Rivers' waste assimilation capacities in terms of dissolved oxygen during critical periods of flow have been analyzed by the University of Minnesota for the MSSD. However, the long-term effects of high river water temperatures on the biota of the streams have not been fully evaluated.

In addition to the effects of temperature on the biota of the stream, another principal effect of thermal discharges is the possible curtailment or limitations placed on the electrical generating plants in the area as a result of the loss of cooling capacity in the waters. This aspect has been studied in detail by the Sanitary Engineering Division of the University of Minnesota for the MSSD and is currently being investigated by the Northern States Power Company in light of the recently adopted standards of water quality on the Mississippi.

AMMONIA, pH, ALKALINITY, HARDNESS, A.B.S.

The presence of ammonia nitrogen in a stream is notable for several reasons. Of particular concern in terms of water quality are the changes that occur in streams receiving waste discharges which may contain varying amounts of nitrite, nitrate, ammonia, and organically bound nitrogen. The effect of these materials on the stream is complicated by the condition of the stream receiving the effluent.

Streams already depleted in DO will utilize oxygen in nitrate, thereby converting the nitrate to ammonia, nitrogen gas and proteinaceous matter. Streams with sufficient oxygen resources will continue the oxidation or assimilation of ammonia to proteinaceous material, nitrogen gas, nitrite and nitrate. Oxidizeable nitrogen becomes a part of the biochemical oxygen demand exerted on the stream. It is known that ammonia is a substance toxic to many forms of aquatic life at high levels and under alkaline conditions. Results of the survey of 1960 and 1961 by the Minnesota Department of Health indicate some high ammonia values and no pH values in the acidity range. However, the data are too limited for the drawing of conclusions at this time and should have further study.

The test for A.B.S. is a measure of the large, anionic-type molecules which, in streams, are representative of the synthetic organic detergents now contaminating many surface and ground waters. A.B.S. is that portion of a common household or industrial cleaning compound that imparts foam and reduces surface tension to aid in the removal of dirt particles by the cleaning compound. A.B.S. is believed to be nontoxic to man in the concentrations found in contaminated waters; but it produces unsightly, persistent foams in streams at points of agitation or discharge over dams. Although no data are available on the A.B.S. content of the river, reports have been received of waves of suds several feet high generated by the action of barge tows leaving terminals.

The Minnesota Health Department, in collecting samples during the 1960-1961 investigations, reported determinations of alkalinity and hardness on some of the samples. Alkalinity expressed usually as $CaCO_3$ is a measure of the neutralization reserve present in a water, or the extent to which the water can resist a change from an alkaline to an acid condition upon addition of acidic chemicals. Hardness also expressed as $CaCO_3$ is not only a measure of the soap-consuming property, but is also of importance in the treatment of boiler waters, where it is one of the most important factors.

The data collected by the State indicate some significant changes in both alkalinity and hardness between adjacent stations sampled the same day. Their data are summarized on the next page:

(The data referred to are as follows:)

Stations	Change in Alkalinity mg/l as $CaCO_3$	Change in Total Hardness mg/l as $CaCO_3$
M-6.2 to M-4.9	150 to 350	
M-0.1 to M+0.1	230 to 170	
M+3.1 to M+3.2	160 to 220	180 to 440
M+4.6 to M+5.2		170 to 260
M+5.6 to M+5.8	120 to 220	110 to 320
M+7.5 to M+7.9	150 to 270	180 to 300

It is possible that the heavy volumes of ground water used for air conditioning within the metropolitan area contribute to the increases in alkalinity and hardness as noted in this table.

CONTROL ACTIVITIES OF STATE AGENCIES

The Wisconsin Committee on Water Pollution and the Minnesota Water Pollution Control Commission adopted a joint resolution concerning waste treatment requirements for interstate waters of the St. Croix and Upper Mississippi Rivers and their tributaries in 1953. The resolution provided that "for treatment of sewage and for industrial wastes shall provide at least effective sedimentation or equivalent, substantially complete removal of floating solids or liquids, and reduction of toxic materials to less than lethal limits for aquatic life, with the understanding that additional or special type treatment be required in those areas where water uses so dictate." The two State water pollution control agencies have worked with municipalities and industries to accomplish the objectives of the joint resolution.

Though the bi-State agreement between the official pollution control agencies of Minnesota and Wisconsin requires a minimum of primary treatment on the interstate stretch of the Mississippi River, the City of Red Wing, Minnesota, in an independent action, constructed secondary treatment facilities for its wastes. The protection of recreational water uses in the downstream areas of Lake Pepin was recognized by this action.

Both States have effective water pollution control laws. Within the area under consideration, the Wisconsin Committee on Water Pollution can point to waste treatment facilities for every sewered community. Similarly, the Minnesota Water Pollution Control Commission has received compliance from each sewered community on its portion of the interstate section of the Mississippi and St. Croix Rivers.

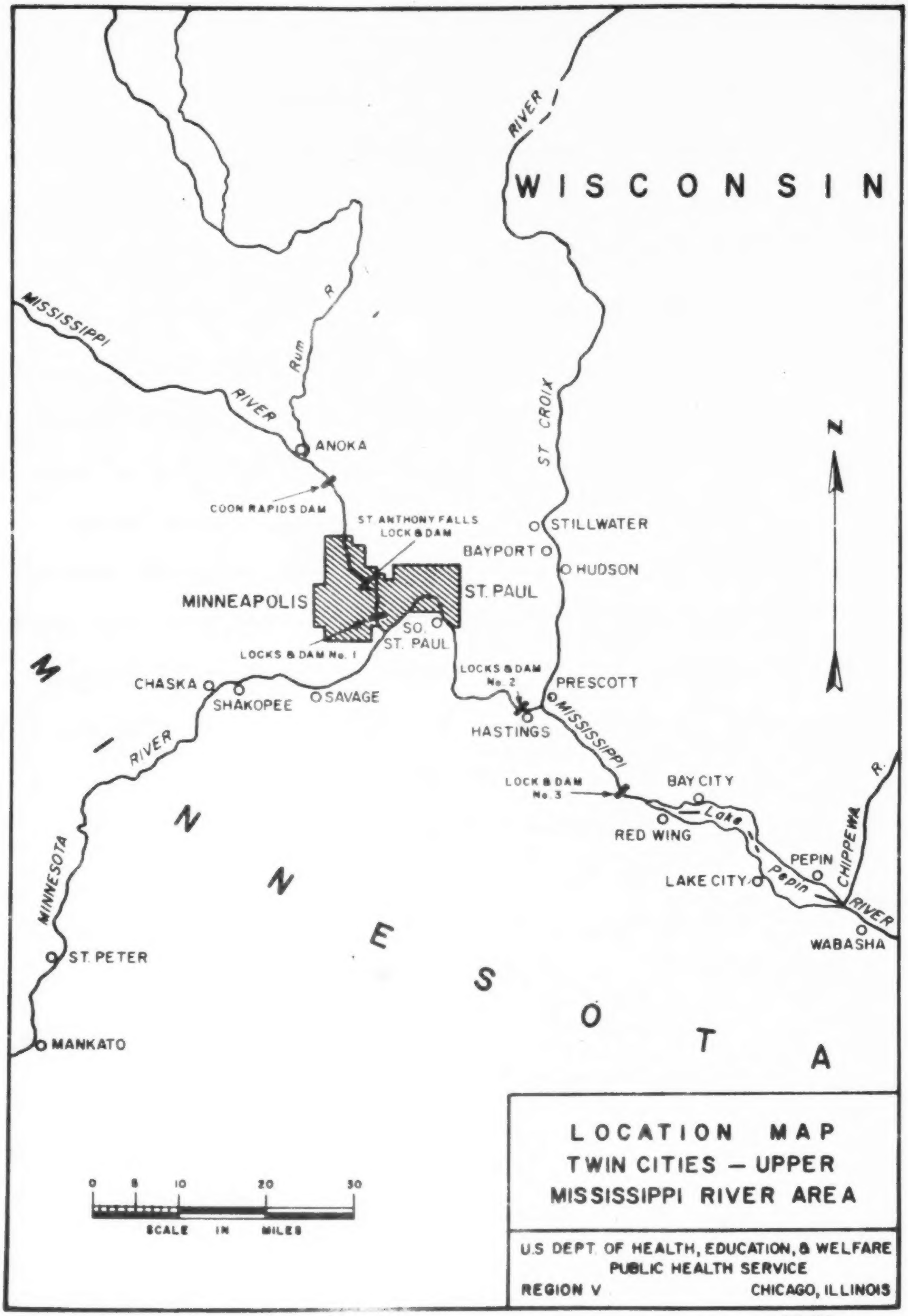
Each State has used the grant provisions of the Federal Water Pollution Control Act for sewage plant construction effectively. Ten plants involving a total eligible cost of $4,309,878 have been granted $1,201,513 in Federal funds.

Of primary importance in the control of water quality in this area has been the adoption in March 1963, by the Minnesota Water Pollution Control Commission, of classification standards for the Mississippi River and its tributaries in the stretch from the Rum River to Hastings, Minnesota. Essentially, the classification program provides for three zones of varying use and quality. These range from the highest uses, including public water supply and swimming, in the zone from the Rum River to St. Anthony Falls, to waters for limited recreational, industrial and commercial use in the zone from St. Anthony Falls to the outfall of the MSSD plant, and finally to the third zone from the MSSD plant outfall to the Hastings Dam, which allows use for industrial process and general cooling, stock watering, restricted irrigation, disposal of treated wastes, fish survival and very limited recreational activities.

Standards of quality are set for each zone. Dissolved oxygen, for example, has an upper limit that ranges from a 5 mg/1 requirement in the upper zone to a 4 mg/1 level in the middle zone, and finally to a 2 mg/1 standard for the lower zone. Each is based on the monthly average flow which is exceeded by 90 percent of the monthly average flows of record for the month of August or February, whichever is lower. The development of this intrastate section of the Mississippi as well as the Minnesota River within the Twin Cities area will be dictated by the dissolved oxygen levels and other standards required in the classification program.

The Minneapolis-St. Paul Sanitary District is the major waste contributor in the area. This agency has collected a vast store of water quality information for significant stretches of the Mississippi River since 1926. A five-year project sponsored by the MSSD and conducted by Professor George J. Schroepfer of the Sanitary Engineering Division, University of Minnesota, was completed in 1961. This intensive study assessed the capabilities of the Mississippi River to assimilate the discharge of present and expected waste loads in the critical stretch below Minneapolis-St. Paul. Design of the secondary treatment facilities, which are now under construction, was based upon the findings of Professor Schroepfer's report and the 1963 River Standards Classification of Minnesota Water Pollution Control Commission.

(Figure 1 is as follows:)


WISCONSIN
RIVER
MISSISSIPPI
RIVER
Rum R
ANOKA
COON RAPIDS DAM
ST. ANTHONY FALLS LOCK & DAM
MINNEAPOLIS
ST. PAUL
SO. ST. PAUL
LOCKS & DAM No. 1
ST. CROIX
STILLWATER
BAYPORT
HUDSON
LOCKS & DAM No. 2
PRESCOTT
HASTINGS
MISSISSIPPI
LOCK & DAM No. 3
BAY CITY
RED WING
Lake Pepin
PEPIN
LAKE CITY
CHIPPEWA R.
RIVER
WABASHA
CHASKA
SHAKOPEE
SAVAGE
MINNESOTA RIVER
ST. PETER
MANKATO
MINNESOTA
N
0
8
10
20
30
SCALE IN MILES

LOCATION MAP
TWIN CITIES — UPPER
MISSISSIPPI RIVER AREA

U.S. DEPT. OF HEALTH, EDUCATION, & WELFARE
PUBLIC HEALTH SERVICE
REGION V CHICAGO, ILLINOIS

FIGURE 1

APPENDIX

BACTERIOLOGICAL EXAMINATION OF STREAM SAMPLES*

(*Statement prepared by Mr. Harold F. Clark, Microbiologist, In Charge of Water Forms and Studies, Research Branch, Division of Water Supply and Pollution Control, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.)

Microbiology
Water Supply and Pollution Control Research
Robert A. Taft Sanitary Engineering Center
U.S. Department of Health, Education, and Welfare
Public Health Service
Cincinnati, Ohio

J. M. Rademacher

Introduction to Methodology

The Standard tests for the coliform group described in Standard Methods for the Examination of Water and Wastewater, 11th edition, 1960 (1) are designed specifically for the quantitative determination of the coliform group. The coliform group includes all the aerobic and facultative anaerobic, non-spore-producing, gram-negative rods which ferment lactose with gas production within 48 hours at 35 (plus or minus 0.5)° C. The standard tests are:

1. Presumptive Test (based on gas production from lactose) in which a negative reaction excludes the coliform group and a positive test indicates that coliform bacteria may be present.
2. Confirmed Test which demonstrates gas production from lactose in the presence of bile salts and brilliant green or the production of nucleated (with or without sheen) or opaque, mucoid, unnucleated colonies confirms the presence of the coliform group, using Eosin Methylene blue agar or Endo agar plates.
3. Completed Test in which the coliform bacteria

is isolated in pure culture and demonstrated to produce gas from lactose as well as consisting of gram-negative rods consistent with the morphology of the coliform group. This is the coliform reference test for the multiple tube procedure in Standard Methods (B.3. page 499).

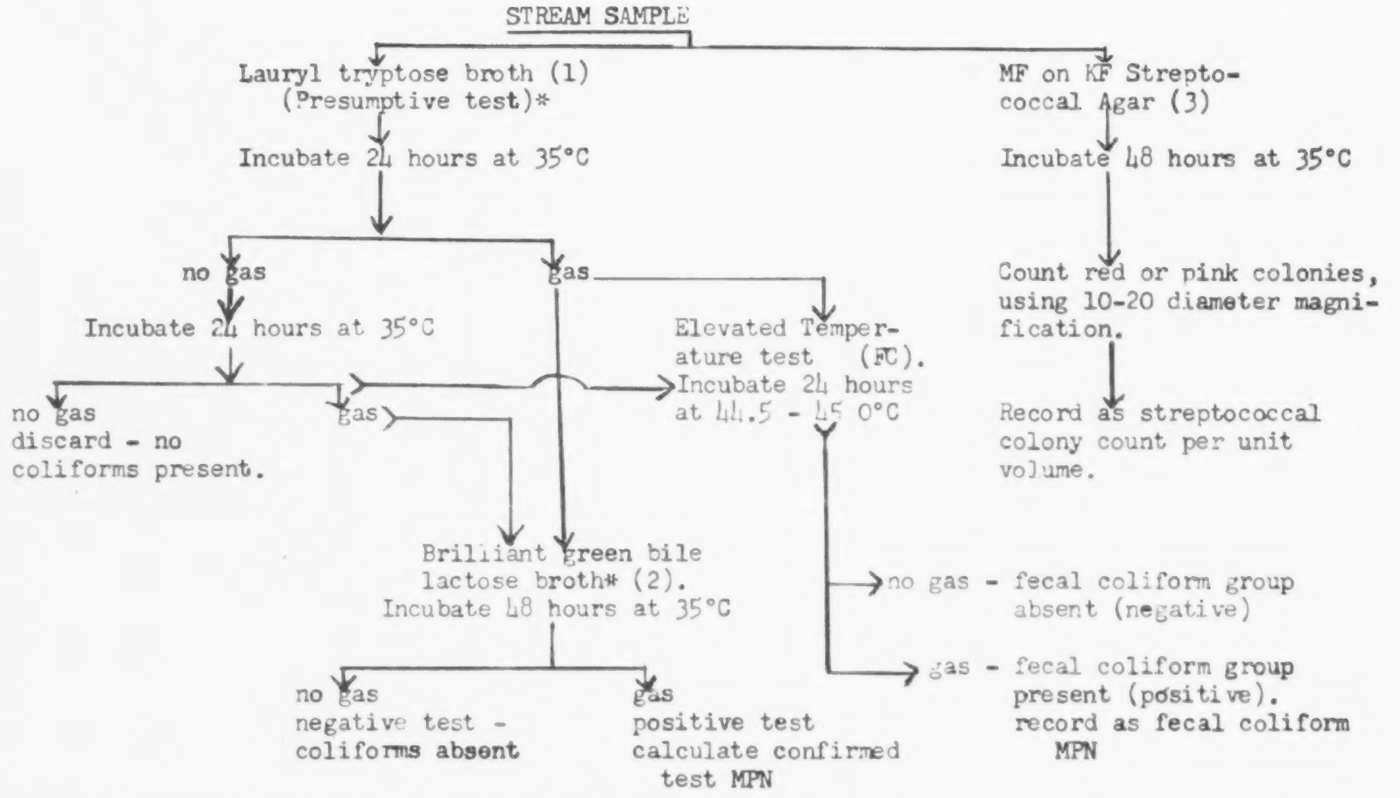
4. Membrane Filter Technique consisting of filtration of the sample through a membrane filter, cultivation of the coliform colonies on the filter surface using the Standard Methods (12. page 488) M-Endo Medium and counting coliform colonies for a "coliform colonies" count.

The above Standard Methods procedures, by not distinguishing between the various types of coliform bacteria composing the coliform group, yield no information as to their possible source or origin. A group of tentative differential tests is described but no suggestions are given as to their interpretation other than such procedures seldom give sufficient information to justify the labor and time required for the procedures. Presence or absence of the coliform group is all that is necessary in the bacterial examination of a potable water and the standard tests are adequate for this purpose (2).

The objectives in the bacteriological investigation of untreated surface waters, such as used in a stream survey, must go beyond the procedures described in *Standard Methods.* Bacteriological objectives include the quantitative estimation of all indicator microorganisms of pollution so that as much information as to the probable sources and significance can be collected as is consistent with accepted bacteriological research methods and practices.

In the accomplishment of these objectives, it is necessary to use newer research methods which are beyond the scope and objectives of the procedures in *Standard Methods.* The testing methods include the elevated temperature test, which indicates the fecal or non-fecal origin of coliform bacteria,and the streptococcal method as an indicator of pollution. Both of the procedures and their interpretation have been established by detailed research investigations on the distribution of indicator microorganisms in feces as well as in other environments (3, 4, 5, 6, 7, 8).

Bacteriological procedures used in the examination of stream samples are shown in the following schematic diagram. Procedures which are marked with an asterisk are described in *Standard Methods* while unmarked methods represent tests not described and are the product of recent research studies.


STREAM SAMPLE
Lauryl tryptose broth (1) (Presumptive test)*
Incubate 24 hours at 35°C
no gas
Incubate 24 hours at 35°C
no gas discard - no coliforms present.
gas
gas
Elevated Temperature test (FC). Incubate 24 hours at 44.5 - 45 0°C
Brilliant green bile lactose broth* (2). Incubate 48 hours at 35°C
no gas negative test - coliforms absent
gas positive test calculate confirmed test MPN
no gas - fecal coliform group absent (negative)
gas - fecal coliform group present (positive). record as fecal coliform MPN
MF on KF Streptococcal Agar (3)
Incubate 48 hours at 35°C
Count red or pink colonies, using 10-20 diameter magnification.
Record as streptococcal colony count per unit volume.

* Indicates procedure described as standard test in Standard Methods for the Examination of Water and Wastewater, 11th ed. (1960).

(1). Lactose broth may be substituted for lauryl tryptose broth.
(2). Eosin Methylene blue or Endo agar may be substituted for the brilliant green bile lactose broth.
(3). The KF Agar pour plate count may be used interchangeably with the MF colony counting technique.

Discussion of Tests

Stream samples are collected and examined for the coliform group according to the procedures described in Standard Methods. These procedures include the use of lauryl tryptose broth for a screening test and confirmation of the presumptive positive tubes in brilliant green bile lactose broth. This is considered preferable to the lactose broth option in the presumptive test and the Endo or Eosin-Methylene Blue plate options in the confirmed procedure. The "Confirmed Test" enumerates the coliform group in the sample but yields no information as to probable source, such being derived from feces, soil, plants, etc.

Elevated Temperature Test (EC) at 45° C

The procedure for the Elevated Temperature Test consists of the following steps:

1. Transfer a loop of broth from the positive presumptive tube to an EC broth tube containing an inverted vial to indicate gas production.
2. Place the inoculated EC tube, within less than 30 minutes after planting, in a water bath at 44.5 - 45.0° C.

3. Incubate at 44.5 - 45.0° C for 24 (plus or minus 2) hours in water bath.
4. Record the presence or absence of gas in the inverted vial.

The presence of gas in the inverted vial is a positive reaction indicating that coliforms derived from the gut of warm-blooded animals (fecal coliforms) were present in the sample. Absence of gas indicates the absence of fecal coliforms in the tube since the members of the coliform group derived from non-fecal sources generally fail to produce gas in this medium at 44.5 - 45.0° C. The fecal coliform density is calculated on the number of positive and negative tubes in the series in the same manner as for the coliform group MPN.

Streptococcal Colony Count

Streptococcal enumerations are made by the mebrane filter technique using KF Streptococcus Agar as nutrient substrates. The medium is prepared as follows:

1. Mix 7.64 grams of KF Streptococcus Agar (Difco 0496) with 100 ml sterile distilled water in a sterile flask.
2. Place the flask containing the mixture in a boiling water bath to dissolve the medium containing

the agar.

3. After solution is complete, continue heating in the boiling water bath for five (5 minutes.

4. Cool medium to between 50 - 60° C.

5. Add one (1) ml of sterile aqueous solution of one (1) per cent TTC (triphenyl-tetrazolium chloride)* solution and mix.
(* 2,3,5-triphenyl-tetrazolium chloride No. 6533,

Eastman Organic Chemicals, is recommended. Do not autoclave solutions of this compound.)

6. Pour from 5-8 ml of melted medium in each sterile plastic petri dish (Flacon No. PD5012) and replace lid until medium hardens.

The medium is ready for immediate use or may be used at any time within 30 days, provided it is stored in a dark place and no evaporation has occurred during storage.

The procedure for the test consists of:

1. Filter an appropriate quantity of sample through the membrane filter.

2. Place Filter on KF Streptococcus Agar, grid side up, using care to have no air bubbles between the membrane filter and agar surface.

3. Incubate at 35° C for 48 hours (up to 72 hours is permissible).

4. Count all red or pink colonies, using a magnification of 10-20 diameters. Orange, yellow, white or other colonies with other colors, except red or pink, should not be counted since such types have not been observed in fecal examination.

5. Calculate count per unit volume as streptococcal colony count per unit (usually 100 ml or 1 ml) volume.

The group of streptococci which meet the above definition are always found in feces and has little or no ability to produce aftergrowth in the stream. They are present in greater numbers than the coliform group in the feces of most domestic animals, while the coliform group outnumber the streptococci in human excreta.

Fecal streptococci, like the fecal coliform group, is interpreted to indicate fecal pollution. As the numbers of the indicators increases, the quantity of fecal pollution increases. However, each should be considered as an independent indicator of pollution. Survival rates of each group vary under any specific environment and may vary greatly from environment to environment. Conditions may exist where one or the other indicator may die at a greatly accelerated rate.

REFERENCES

1. Standard Methods for the Examination of Water and Wastewater, 11th ed. pp. 477-513, (1960). Am. Pub. Health Assoc., New York 19, New York.

2. Kabler, P. W. and Clark, H. F. Coliform group and fecal coliform organisms as indicators of pollution in drinking water. J.A.W.W.A., 52, 1577-1579 (1960).

3. Geldreich, E. E. et al., The Coliform Group. II. Reactions in EC Medium at 45° C. Appl. Microbiol., 6, 347-348 (1958).

4. Geldreich, E. E. et al., Type distribution of coliform bacteria in the feces of warm-blooded animals. J.W.P.C.F., 34, (1962). In press.

5. Geldreich, E. E. et al., Fecal coliform flora of soils from various geographical areas. J. Appl. Bact. (Brit.) 25, (1962). In press.

6. Kenner, B. A., Clark, H. F. and Kabler, P. W., Fecal Streptococci. I. Cultivation and enumeration of streptococci in surface waters. Appl. Microbiol., 9, 15-20 (1961).

7. Kenner, B. A., Clark, H. F., and Kabler,

P. W., Fecal Streptococci. II. Quantification of streptococci in feces. Am. J. Pub. Health, 50, 1553-1559 (1960).

8. Bartley, C. H. and Slanetz, L. W. Types and sanitary significance of fecal streptococci isolated from feces, sewage and water. Am. J. Pub. Health, 50, 1545-1552 (1960).

J. M. Rademacher

ERRATA SHEET

1. Figure 3 - Delete Wright Products Plant, 829.0.

2. Page 13 - 1st Line - "used by commerce and industry."

3. Table 4 - 3rd Page - PE Discharged to Stream -- Prescott, Wisconsin, 945E; Hudson, Wisconsin, 820E; and Pepin, Wisconsin, 515E.

4. Page 28 - Line 19 - Hudson Mfg. Co., Hastings, Minnesota, provides chemical treatment (Minn. WPCC Report Jan. 20, 1964).

5. Table 7 - Retitle - Terminals - Docks and Storage Areas.

6. Page 34 - "Plazas" instead of suburban shopping "places."

7. Page 43 - Adjust Figures to reflect the increased load from South St. Paul -

(From 14,500#'s to 27,000#'s)

(From 228,180#'s to 27,000#'s)

(From 225,940#'s to 238,190#'s)

8. Page 44 - After line 5 - same paragraph - Should add: These objectives agree with the stream

standards adopted by the Minnesota Water Pollution Control Commission in March, 1963.

9. Page 50 - last paragraph - "phenolics" instead of "phenols."

10. Page 59 - last paragraph - insert "by the Minnesota Water Pollution Control Commission" after "March, 1963."

* * *

MR. STEIN: Thank you, Mr. Rademacher.

Do we have any comments or questions from Minnesota?

DR. HARGRAVES: Well, I thought not. I thought we would ask our questions and talk later.

Lyle, do you want to ask any questions?

MR. SMITH: Whenever you say.

DR. HARGRAVES: Do you want to open it?

MR. STEIN: If you wish. Mr. Rademacher is here now.

DR. HARGRAVES: You mean we won't catch him again?

MR. STEIN: You may have the privilege of catching him all the time. You can do this as you wish.

DR. HARGRAVES: I think we had better proceed through your list of guests.

MR. STEIN: Do you have any questions or comments from Wisconsin?

MR. MUEGGE: We will postpone questioning also at this time.

MR. STEIN: Thank you very much, Mr. Rademacher.

MR. POSTON: I might ask Jack a question.

He uses the terminology "coliform" and he uses "fecal coliform" and "fecal streptococcus." I was wondering whether or not somebody might have a question as to what all this means, and whether you could give them a little lay language on what you are talking about here.

MR. RADEMACHER: Well, I think, with respect to these specific tests that we have here today, probably one of the foremost experts in the field of microbiology, who had a lot to do with the development of the differential tests for coliform, the fecal coliform and the fecal streptococci tests, is Mr. Harold F. Clark. I think he could probably answer those specific questions much better than I.

These essentially tell you more definitely where these coliforms will come from. They tell you whether they are from sewage or whether they are from soil, or whether they are from animal or man.

MR. POSTON: I would suggest we ask Harold Clark to do this then.

MR. STEIN: Is he available? Is Mr. Clark in the room?

MR. CLARK: Yes.

MR. STEIN: Would you come up, Mr. Clark?

I think in a sense we are very fortunate to have Mr. Clark here, because he is the man who developed these tests.

By the way, as Mr. Clark is coming up, I want to take this opportunity to acknowledge my personal debt to the man sitting on my left, Mr. Chester Wilson, who has been one of the grand men in the business. I want to say that in large measure I have learned a good deal of what I know from Mr. Wilson, as I suspect many people in my generation have. He has been an inspiration to all of us in this field of water pollution control.

If Mr. Wilson can remember, trying to prove a case in pollution control for many, many years, in dealing with coliform bacteria, we never could be sure precisely where they came from, whether they came from the runoff from land, whether they came from one city or another city. Mr. Harold Clark has devised a method where he practically has a fingerprinting device. He can tell you whether it comes from a runoff of land, whether it comes from a sewage treatment plant, which city it comes from, and whether it comes from an animal like a sheep or a cow, or whether it comes from a human.

Mr. Clark is about ready to retire now. Half facetiously, but I think he is right, he says if he had a little more active life to work on this research problem, he could tell whether it came from a male or a female.

(Laughter.)

Mr. Clark.

MR. CLARK: In answer to the question on the total coliform group, the total coliform group comes from a variety of sources. It may come from the raw foods that you prepare.

We have, in addition to that, the fecal coliform group, and the coliform group is defined as those coliform groups that are derived from the guts of warmblooded animals. In other words, the fecal coliform group is specifically a measure of the amount of fecal pollution in the river, exclusive of fish.

The greatest hazard, I would say, from a point of the public health view, is those coliforms that come from fecal pollution. I would consider them much more hazardous than I would those that came from soil erosion or some other source.

We have the elevated temperature test that distinguishes and characterizes fecal coliform, which I have defined, and that is accurate, with relatively good accuracy, for a biological test. I would say it will discriminate with between 96 and 97 percent accuracy.

Then we can determine the non-fecal coliforms by subtraction of the total coliforms from the fecal coliforms, and in that way we can prove which came from domestic waste or fecal pollution, and which came from soil erosion, or from other sources that I can't describe.

Now, did you ask a question on the streptococci?

MR. POSTON: Yes.

MR. CLARK: Furthermore, we have the fecal streptococci. Now, this group of the streptococci are a group of these bacteriological groups of the streptococci which are characteristic of feces. We have found in the human feces four species of streptococci. That is, the streptococcus faecalis variety faecalis, variety zymogen, streptococcus variety liquefacien, and streptococcus durans These four species are characteristic of human pollution.

I have, if I may tell a little personal experience here?

MR. STEIN: Go right ahead.

MR. CLARK: One of the engineers said that the absence of streptococcus bovis, which is in the human species, was due to the fact that they weren't exposed to enough streptococcus bovis. So, we went out to the prison in Ohio, and we had picked ten individuals who had been working in the cow barns for a minimum of twelve years and a maximum of twenty years. They were all lifetime prisoners under sentence for murder.

We checked those and found not a single streptococcus bovis in the group.

In addition to these that I mentioned from human origin, we have studied animals, and we find that in the various animals the streptococcus bovis, the acidominimus, equimus and unidentified variants of streptococci are of animal origin. Furthermore, the ratio of fecal coliform to streptococci in domestic waste runs from 4-½ to 8-½ to 1, while the ratio in animal wastes, the farm house wastes, always runs less than 1 and down to five-tenths, indicating that the streptococcal group which has indicated a pollution is the predominating group in domestic animals other than humans, or wild animals other than humans, while the fecal coliform is the predominating group in the strictly domestic waste that would come through the average sewage treatment plant.

Does that answer your question?

(Applause.)

MR. MUEGGE: You have been using names for these organisms. What are the fecal coliforms by name?

MR. CLARK: The fecal coliforms by name would be your eschrichia group, which is controlled principally by the eschrichia coli. There is also the eschrichia frundii and also the various other forms of the eschrichia, and we also find in the human gut some of the aerobacters, which is different from the aerobacters that you find in soils.

So, we have divided the coliform groups into two characteristics, instead of going into a lot of funny names, as I have been talking about, the fecal coliform group and the non-fecal coliform group, and we stopped naming them right there.

MR. MUEGGE: Can you differentiate between animal and human coliforms?

MR. CLARK: No, sir, you cannot differentiate between the animal and the human fecal coliforms, except on a quantitative and statistical density difference.

MR. STEIN: I think Dr. Hargraves may have a question.

DR. HARGRAVES: Mr. Clark, I just want to sort of set the record straight. I think the public is pretty well excited and upset when we talk about fecal organisms and their presence as a measure of pollution.

Now, how many of these that you have named are pathogenic?

MR. CLARK: Of the organisms that I have named, none of them are pathogenic.

DR. HARGRAVES: So that we have to set this up then as simply a measure that there is contamination in the water?

MR. CLARK: Yes, sir. I would like to qualify my answer just one bit.

DR. HARGRAVES: All right.

MR. CLARK: Except that in children under one year of age, we have some of it pathogenic, serotype 0-111 and 0-055, and various serotypes; but in the adults or those past one, two or three years of age, they are not pathogenic.

However, the significance of this is where you find the fecal coliform, we may find the enteric pathogenic bacteria, you may find various associated viruses, you may find various types of parasitic organisms, and other organisms that aren't pathogenic that may be associated with fecal pollution.

So, whenever we find fecal pollution or these fecal organisms, that proves the presence of the fecal pollution, and then you have the hazard you have due to any fecal pollution added to a stream.

DR. HARGRAVES: And yet just to have a high count of coliform organisms doesn't necessarily mean that we have any of these.

If we had a sample of our bath water, for example, I think most people would go to showers, wouldn't they, if they sampled it after they had a bath?

MR. CLARK: That is probably true.

DR. HARGRAVES: And if we washed our hands, and so on, and sampled that, it would be about the same?

MR. CLARK: The majority of those, I would say, would probably be classified in the non-fecal group, Dr. Hargraves.

(Laughter.)

DR. HARGRAVES: I don't think you see the same patients I do.

(Laughter.)

MR. CLARK: I consider these indicator organisms do indicate fecal pollution.

DR. HARGRAVES: I will agree with you. I did not want to discount it in the least. I simply wanted to get at what it means in the evaluation of our water, and we do have it polluted, but I just wondered whether these organisms in drops of water that hit a water skier's mouth and so on, how important they are.

Our children are at school all day getting coughs and colds from people that are coughing and sneezing in their faces, and these droplets contain pathogenic organisms. We run into them all the time, and we do have body defenses to take care of them. If we don't have typhoid carriers and if we don't have some of the other things, this count actually falls in importance, as far as a swimming pool or a swimming beach is concerned, or the use of the water by

Reproduced from best available copy.

a skier.

MR. CLARK: I agree that these are non-pathogenic organisms, and that their ingestion would not hurt the individual.

DR. HARGRAVES: I agree that they indicate pollution.

MR. CLARK: I wish we had methods for isolating pathogens quantitatively, which I have been unable to develop

DR. HARGRAVES: Yes. So do I.

MR. CLARK: However, I also wish to say that if coliform levels or high levels are allowed to continue over long periods of time, that sooner or later the hazard of pathogenic entities gradually increases with increased exposure.

MR. STEIN: Mr. Wilson?

MR. WILSON: Mr. Clark, for the information of quite a few people here who might not understand the technical terms, when you say "pathogenic" you mean disease-producing?

MR. CLARK: I meant the organisms that would produce disease.

MR. WILSON: And could you tell us what are the common names of some of the water-borne diseases whose bacteria might be transmitted through water, and whose presence might be indicated by these coliform and streptococcus bacteria which are known to be of human intestinal origin? What are some of the actual disease organisms that might be transmitted along with the coliform and streptococci?

MR. CLARK: I think Dr. Hargraves would probably be better qualified to answer that, but I will make an attempt at it.

We use these indicator organisms and apply the principle of condemnation by association. The indicator organisms may associate with these pathogenic entities I have mentioned.

Now, as to the common names for those, in the older days we had typhoid fever. I haven't seen a typhoid fever epidemic for a good many years in this country. However, some of the foreign countries haven't been quite so fortunate.

MR. WILSON: You know that they had one in Minneapolis here about 1935, do you not?

MR. CLARK: Yes, sir. I know it, and it was water-borne. I wasn't going to bring that up.

(Laughter.)

MR. STEIN: You did visit one in Switzerland last year, didn't you?

MR. CLARK: I visited one in Switzerland. That was due to the fact that the water contained fecal excreta from a carrier, and it amounted to some thousand cases, I believe.

DR. HARGRAVES: A lot of salmonella belongs to that group too, and we have a problem at the present time that I think people might be interested to know that the common duck is one of the common carriers, and it has been transmitted by the duck eggs to people who have eaten duck eggs. This is a sort of paratyphoid type of infection we have been plagued with in the last few years.

MR. CLARK: Yes, sir.

To continue with Mr. Wilson's question, the salmonella can cause various types of food poisoning. Many of those cases, I think, can be such that they are accompanied by a little distress, headache, but not of sufficient intensity to go to bed, just to lose a little bit of work. You don't eat for a while, and I think those belong to the salmonella group.

Then we have also isolated tuberculosis organisms from water. Also, tularemia has been isolated from some water supplies, particularly in the Canadian western lakes. There is also the possibility of viruses being isolated from water or being present in the water. We had isolated polio virus from sewage and water waste in Manila during World

War II. We have documented several cases of infectious hepatitis being spread by water-borne causes, where the chlorination was sufficient to destroy all our indicator organisms, but still not sufficient to destroy the infectious hepatitis.

In some of the tropics, cholera is one of your big water-borne diseases, as well as diarrhea caused by amoeba.

So, those are some of the diseases that may be water-borne, not exclusively or completely, but a few examples.

DR. HARGRAVES: There is only one other thing. I think you further drive this home, and with the world travel that we have, we are seeing more and more people bring these things back, staying at hotels and motels and being in hospitals, and having them go on through the sewage disposal plants and into our water too.

MR. MUEGGE: Mr. Clark, could you give us a ratio of coliform organisms in sewage as compared to the fecal coliforms in sewage?

MR. CLARK: I was hoping nobody would ask that question. It varies.

In the domestic sewage from the Hyde Park area in Cincinnati, it will run about 34 percent, and in a series of 30 different sewages of different cities, the ratio varied from 25 percent to around 55 percent.

The fresher the sewage and the less treatment it has, the higher the percentage of fecal coliform is to the total coliform.

MR. MUEGGE: Could you give us a similar comparison between the fecal coliform and probable pathogens?

MR. CLARK: No, sir. The probability of pathogens would vary with each individual area. It would depend upon what kind of epidemic you had going on in the watershed. It would depend upon your carrier rate. It would depend upon your climatic rate. It would depend upon your social economic level. It would depend upon the efficiency of your Public Health regulations and Public Health Department. It would depend upon a whole variety of factors, also on climatic factors, and I wouldn't even risk a guess.

MR. STEIN: Before you leave, let me check if I am right on this. I know this is a really technical discussion.

As I understand this, the situation we have in dealing with the pathogens is that if a disease-producing organism, whether it be bacteria, or a virus, or what have you, is in the water, generally the numbers of these actually disease-producing organisms are so relatively few, that it is very, very difficult for one of the investigators to particularly isolate them.

What they do then is try to get an indicator organism, such as the coliforms or the streptococci or the staphylococci organisms, and try to identify where it comes from, on the assumption that if you can identify this with enough indicator organisms from, say, sewage which is not being treated, statistically you can assume that the disease-producing organisms are there.

If you get that, for example, from a runoff from fields, you would assume that less disease-producing organisms are there. If you get this from, say, packinghouse waste rather than human waste, I think the assumption of the kind of disease potential or hazard you would get would be different.

This is the significance of Mr. Clark's work and his discovery. If I have oversimplified it or overstated that, you can comment.

MR. CLARK: I would like to add one additional qualification.

MR. STEIN: Very well.

MR. CLARK: In our work, we have found that the maximum reservoir of pathogenic salmonella are the turkey, the duck and the chicken, and that they are far greater hazards than humans, so I do not see any logical reason for separating domestic animal pollution from human pollution as far as the public health hazard goes.

MR. STEIN: Thank you.

MR. WILSON: Mr. Chairman, while Mr. Clark is here, I should like to say that he was one of the star witnesses during the hearings conducted by the Minnesota Water Pollution Control Commission in preparation for the adoption of the standards for these sections of the Mississippi River last March that were mentioned by Mr. Rademacher, and I should like to express our public appreciation to Mr. Clark and his associates in the Public Health Service for the notable assistance that they gave us during that effort.

MR. STEIN: Thank you.

MR. CLARK: Thank you, Mr. Wilson.

MR. STEIN: Mr. Poston?

MR. POSTON: As the Federal conferee, I am anxious that other Federal agencies have an opportunity to tell of their concern for pollution and clean water and the water uses that they may be interested in, and for this purpose I have written and requested the Federal agencies if they cared to be heard at this meeting.

We have today with us Mr. H. C. Jordahl, representing the United States Department of the Interior. I would like to ask at this time that he make his presentation on the interests of the Department of the Interior.

STATEMENT OF HAROLD C. JORDAHL, JR., REGIONAL COORDINATOR, UNITED STATES DEPARTMENT OF THE INTERIOR, IN THE STATES OF MICHIGAN, MINNESOTA, WISCONSIN, IOWA AND ILLINOIS

MR. JORDAHL: Thank you, Mr. Poston.

Mr. Chairman, conferees and ladies and gentlemen:

My name is Harold C. Jordahl, Jr., Regional Coordinator for the U. S. Department of the Interior in the States of Michigan, Minnesota, Wisconsin, Iowa and Illinois.

I have a longer statement for the record which has been provided to your reporter. What I would like to do is briefly condense this statement for oral presentation.

MR. STEIN: Your full statement will appear as if read.

MR. JORDAHL: The Department is pleased that the States of Minnesota and Wisconsin are concerned with the matter of pollution on the Upper Mississippi River. We pledge our assistance and cooperation to the States and to the Public Health Service in the specific action designed to meet the problem in that reach of the river from Anoka, Minnesota, through Lake Pepin, including the major tributaries.

Secretary of the Interior Stuart Udall, in a statement before a subcommittee of the House Committee on Government O erations early in 1963 expressed the Department of the Interior's interest in maintenance of clean water as follows:

> "... the focus of Interior effort is directed to the maintenance of adequate national water supplies and adequate water quality for whatever uses man may wish to make of this valuable resource. The Interior approach emphasizes the coordination and interrelation between uses and the effect of these uses on management and quality of the total water supply system.
>
> "Maintenance of water quality involves not only the quality levels for human consumption, but also quality levels for consumption by other animal and plant life, for development of other natural resources, and for industrial processes. These quality considerations are interrelated. They can be understood and controlled best from the point of view of water as a resource, rather than from the

H. C. Jordahl, Jr.

"point of view of a particular quality need."

The Department of the Interior has a rich background of experience and knowledge in this area and is equipped with highly qualified technical manpower. All bureaus and offices of the Department have an interest in water resources. In the Mississippi River, the Bureaus of Outdoor Recreation, Commercial Fisheries, Sport Fisheries and Wildlife, Indian Affairs, Mines, Geological Survey and National Park Service have a direct interest. Representatives of several of these bureaus are here today, and I will introduce them to you.

Turning first to the Bureau of Outdoor Recreation, I don't believe we have a representative here today.

That portion of the Mississippi River under consideration has a rich variety of natural resources with which the Department has a concern. The area is located within the Upper Great Lakes Region, which with its forests, lakes, and rivers and its summertime air-conditioned environment, offers a great playground for the vast urban areas in the upper Midwest.

The nine upper Midwest States which make up Mid-America contain 50 million people. Much of this nine-State region is flat or gently rolling prairie, plain and field, and has a relative scarcity of water and topographic resources for recreation purposes, but many fine highways provide ready access to all points of the compass. Mid-Americans making plans for vacations and outdoor recreation look to the Ozarks in the Southwest, to the Smoky Mountains in the Southeast, or to this Great Lakes region to the north.

The highway pattern in Mid-America indicates that the Upper Mississippi River is within easy reach of these 50 million people. The States along the Mississippi River are developing the Great River Road Parkway along the river. Moreover, the area under study includes the large metropolitan Minneapolis-St. Paul, Minnesota, complex.

I might say, in conjunction with that, that a considerable amount of planning work has been done by the National Park Service, the Bureau of Public Roads, and the States of Minnesota and Wisconsin, developing this great scenic highway.

Moreover, considerable investments have been made by both the Federal and the two State governments in terms of route relocations to preserve the beauty along this great scenic river.

Of more local concern to the Bureau of Outdoor Recreation is the importance of Lake Pepin and the Mississippi River to Anoka, Minnesota, to provide recreation opportunities for the local segment. Within a few minutes drive of this reach of the river over a million people reside. The Mississippi River, in its present condition, fulfills a need for day use recreation activities of many of these people and extended vacations for others. To achieve its full potential, however, clean water is essential if the area is to make its contribution to the social goal and to share in the economic proceeds associated with a healthy recreation-tourist industry. To establish a balanced recreational economy it is necessary to build on the natural resource base -- the scenery, the forests, the wildlife and perhaps most important, the water resources.

Populations of deer, ducks, grouse, upland game and other forms of wildlife are important assets in the basin, as are warmwater fishes. Boating and canoeing opportunities exist on many lakes and streams in the basin and on the main stem. Hiking, swimming, camping and driving for pleasure are other important forms of outdoor recreation possible in this area. And, in one way or another, these activities in large measure are dependent upon well managed water resources.

The Outdoor Recreation Resource Review Commission in their voluminous studies highlighted the importance of water to outdoor recreation as follows:

"Water is a focal point of outdoor recreation.

H. C. Jordahl, Jr.

"Most people seeking outdoor recreation want water -- to sit by, to swim and to fish in, to ski across, to dive under and to run their boats over. Swimming is now one of the most popular outdoor activities and is likely to be the most popular of all by the turn of the century. Boating and fishing are among the top ten activities. Camping, picnicking and hiking, also high on the list, are more attractive near water sites. About 90 percent of all Americans participated in some form of outdoor recreation in 1960 -- a total of 4.4 billion occasions. By 1975, the total will be 6.9 billion, and by the year 2000, it will be 12.4 billion -- a three-fold increase by the turn of the century."

To protect, enhance, and to assist in developing the important recreation resources in the Upper Mississippi River Basin are the following Interior Agencies: National Park Service, Fish and Wildlife Service and Bureau of Outdoor Recreation. The Congress recently vested the latter bureau with broad responsibilities associated with the recreation needs of the American people.

Turning now to the interests of the Bureau of Sports Fisheries and Wildlife, we have a representative of that Bureau here today, but he is representing a different group and will make a separate statement for that organization at a later time.

The Bureau of Sport Fisheries and Wildlife is vitally interested in protecting and enhancing the quality of all waters throughout the nation. In this respect, the Bureau is a signatory to a Memorandum of Understanding with the Department of Health, Education, and Welfare concerning water pollution control. This agreement was developed in recognition of common interests in the field of water pollution and to make possible a more effective program of interagency cooperation.

It is in accordance with the Fish and Wildlife Coordination Act of 1956 which authorized the Secretary of the Interior, through the Fish and Wildlife Service and the Bureau of Mines, to make such investigations as he deems necessary to determine the effects of domestic sewage, mine, petroleum, and industrial wastes, erosion silt, and other polluting substances on wildlife, and to make reports to the Congress concerning such investigations and of recommendations for alleviating dangerous and undesirable effects of such pollution. These investigations shall include: (1) the determination of standards of water quality for the maintenance of wildlife; (2) the study of methods of abating and preventing pollution, and (3) the collection and distribution of data on the progress and results of such investigations for the use of Federal, State, municipal, and private agencies, individual organizations and enterprises.

The Mississippi River at its source in Itasca County, Minnesota, flows through a region of forests, lakes and bogs sparsely populated except for the summer months. It begins its journey to the Gulf as pure water. Mile after mile it flows, southward through wilderness areas of central Minnesota, thence into the more populated and open areas to the south, all the while picking up additional flow from tributary streams. The river passes out of the forested area into regions of agricultural activities, housing development and industrial complexes, all of which contribute foreign substances to the river. Some of this material enriches the productive capacity of the water while other materials provide toxic and harmful effects on the aquatic organisms of the river To date the materials having a harmful effect on the quality of the Mississippi River above Coon Rapids Dam have been minor except for a few isolated and local conditions.

The quality of the river water abruptly changes at and downstream from the Twin City area since the

Mississippi River provides a major portion of the basic water resource needs of the Minneapolis-St. Paul metropolitan complex. It is the carrier for all forms of waste products associated with this population center and is being despoiled.

As early as 1928, surveys were conducted by the Minnesota State Board of Health in the reach between the Twin Cities and Prescott, Wisconsin, to determine the extent of pollution and remedial measures needed. The report of the Board noted the presence of offensive odors, floating and suspended materials, sludge and the ebullition of gases arising at numerous places along the river. It was stated further, "that a condition of public nuisance exists, except during periods of relatively high water, between the head of the pool above the Twin City Lock and Dam in Minneapolis and the confluence with the St. Croix River at Prescott, Wisconsin." Another survey from Fridley to Hastings, Minnesota, in 1933 showed that pollution had not improved; in fact, it was more pronounced.

The Minneapolis-St. Paul Sanitary Plant, constructed in 1938, and the St. Paul Waste Plant completed in 1940, reduced the volume of raw sanitary sewage entering the river. However, industrial and storm sewer wastes still create problems.

Reproduced from best available copy.

Where the environment becomes changed or damaged by pollution, the fish population and fish-food organisms have to adjust to the altered conditions or perish. This produces fluctuations of abundance, changes in species composition, changes in growth rate, and many other modifications of the plant and animal life present.

The polluted condition of the Mississippi River between Minneapolis and Hastings, Minnesota, has improved slowly. An environment unfavorable to fish life prevails in the main channel and most backwater areas of Pool #2. The gradual degradation of the aquatic habitat has developed from accumulated wastes discharged into the river over a period of many years at and below the Twin Cities. Only in some of the more isolated backwater areas such as Spring Lake does a sport and commercial fishery still exist.

Dissolved oxygen is one of the major controlling factors in the distribution of fish in the polluted upper river. The Minneapolis-St. Paul Sanitary District has consistently recorded dissolved oxygen levels below 2 ppm, in the vicinity of Hastings during the months of January, February, March, and August. In February of 1962, the DO's averaged 0.5 ppm between the bridge and dam at Hastings, Minnesota. The low DO's occur seasonally during periods of low flow.

The distribution of fish is also affected by direct toxicity to fry and adults, scarcity of desirable bottom fauna, and destruction of spawning areas.

Information in the form of letters from anglers, telephone conversations, and press releases in the files of the Section of Research and Planning, Minnesota Conservation Department include accounts on fish kills above Hastings, Minnesota, and tainted flesh of fish caught in this reach. This is not unusual for an area that provides borderline habitat conditions for fish life. Fish losses below Hastings have been infrequent.

Not only is aquatic animal life affected by discharge of foreign materials into the river but losses occur also to waterfowl, marsh birds, and fur animals such as muskrats, mink and beaver. The events of the winter of 1962-63, when 3,000,000 gallons of soybean oil and 1,000,000 gallons of crude oil distillate escaped into the Minnesota River and thence into the Mississippi River vividly portrayed the devastating results of pollutants on wildlife, especially waterfowl. Several thousand dead and dying ducks along with other wildlife species were reported from stretches of the Minnesota River and the Mississippi River as far south as La Crosse, Wisconsin. During the period March 28 to April 5, 1963, it was estimated that over 5,000 waterfowl were either killed or otherwise affected by the soybean and petroleum spills. However, since many of the ducks heavily drenched with oil tended to crawl into dense cover where they were difficult to find, the total number of ducks lost is probably much larger than the number reported.

Between April 6-9, 1951, oil pollution in the vicinity of Red Wing, Minnesota, killed 250 ducks. Again this figure is probably the minimum.

The future of the sport and commercial fishery and wildlife in and near the Mississippi River and its tributaries between the Rum River at Anoka, Minnesota, and the Chippewa River at the lower end of Lake Pepin will depend heavily upon the measures that are initiated to control the discharge of all types of pollutants into the Mississippi River. A repeat of the oil contamination of 1962-63 should never be allowed to recur. Every effort must be made to improve the existing fish and wildlife habitat so as to develop and maintain a harvestable supply of fish and game species.

Sport fishing is an important summer and winter recreational activity in the Mississippi River primarily downstream from its confluence with the St. Croix River at Prescott, Wisconsin. Upstream from this point, fishing is confined primarily to the tailwater reaches of Lock and Dams 1, 2 and the Coon Rapids Dam near Anoka. Surveys conducted by the Upper Mississippi River Conservation Committee and Conservation Departments of Wisconsin and Minnesota indicate that the sport fish harvest for Pools 1 and 2 are negligible. The reported average annual catch for Pool 3 is 8,000 pounds and for Pool 4 is 73,000 pounds. Sport fishermen generally concentrate in the following areas:

Lock and Dam #2 - tailwater	(Summer)
Mouth of St. Croix River	(Summer)
Lock and Dam #3 - tailwater	(Summer)
Trenton Slough Area, Wisconsin	(Summer)
Vicinity of Red Wing, Minnesota	(Summer)
Goose Lake, Wisconsin	(Summer and Winter)
Bay City Area, Wisconsin	(Summer)
Vicinity of Maiden Rock, Wisconsin	(Winter)
Vicinity of Frontenac, Minnesota	(Summer and Winter)
Frontenac to Lake City, Minnesota	(Summer)
Vicinity of Stockholm, Wisconsin	(Summer and Winter)
Lake City, Minnesota	(Summer and Winter)
Mouth of Bogus Creek, Wisconsin	(Summer)
Vicinity of Pepin, Wisconsin	(Summer)
Lower end of Lake Pepin	(Summer and Winter)

Pools 2, 3 and 4 of the Mississippi River upstream from the mouth of the Chippewa River are spring and fall concentration areas for diving ducks, particularly scaup, ringnecked ducks and goldeneyes. Several thousand have been noted during the waterfowl surveys, periodically conducted by the Bureau and the respective State Conservation Departments. It is not uncommon for 10,000 or more ducks to concentrate in the Spring Lake area where, incidentally, a large percentage of the ducks killed by oil in 1962-63 were found. Fair populations of mallards and other puddle ducks and small numbers of Canada geese and whistling swans also use the river and backwater areas during the migratory seasons.

The entire river is suitable wood duck breeding habitat and substantial numbers are produced. Other breeding waterfowl include mallard and blue-winged teal.

There is little doubt but this reach of the river will be used by a progressively increasing number of fishermen and hunters. Therefore, it should be the primary purpose of individuals, communities, and State and Federal agencies having an interest in the Mississippi River to develop a mutual comprehensive program for reducing the pollution of this interstate stream.

There should be stringent regulatory controls set forth for the discharge of sanitary, storm and industrial wastes into the river in order to prevent further deterioration of the fish and wildlife habitat conditions in the Mississippi River along and beyond the Mississippi River reach presently under consideration.

H. C. Jordahl, Jr.

The Department of the Interior through its Bureau of Sports Fisheries & Wildlife is a major land and water management agency for that reach of the river from Lake Pepin to Rock Island, Illinois. For 284 miles, there stretches one of the most notable wildlife areas on the North American continent, the Upper Mississippi River Wildlife & Fish Refuge. This refuge, 195,000 acres in extent, was established by the Congress in 1924.

Each year the refuge accommodates more than three million visitors; more than any other refuge in the nation. Activities include fishing, boating, hunting, picnicking, camping, swimming and nature study. It is a major resting area for waterfowl during migrations. More than 25 species of ducks use the area. It is a major nesting area for the wood duck. The bald eagle winters in the refuge; winter counts have exceeded 250. A refuge bird list includes more than 250 species. Muskrat, mink, otter and raccoon are common furbearers. Deer are common.

In addition to the refuge, the Bureau operates three warm water fish hatcheries below Lake Pepin -- Genoa, Wisconsin, and the Guttenburg and Fairport hatcheries in Iowa.

To protect the sizeable investments and the public interest, it is extremely important to the Department that the quality of the water be of a high level when it reaches the Upper Mississippi Wildlife & Fish Refuge. Abatement efforts in the reach from Lake Pepin to the Rum River will have a beneficial effect on protecting these interests.

The Bureau of Sports Fisheries & Wildlife will work closely with the States and the Public Health Service on the maintenance and improvement of water quality in the river. I believe Dr. Paul Eschmeyer, from the regional office, is here. If he is, I would like to have him stand briefly and I will introduce him. Dr. Eschmeyer.

BUREAU OF COMMERCIAL FISHERIES

The 1956 Act and a wide variety of other statutes enacted over the years, authorize a broad range of activity by the Bureau of Commercial Fisheries. The national fish policy established by the 1956 Act places high on the list of goals the responsibility for the economic betterment of the commercial fishing industry in all its phases -- production, processing, and distribution. Responsibility extends to the control and prevention of pollution. Pollution is probably the primary factor today that limits the production of food fish and in fact threatens future fish production. The measure of pollution as used here is the suitability of water for a required use. The Bureau of Commercial Fisheries is concerned with the suitability of the waters of the Mississippi River for production of fish and fish food organisms.

H. C. Jordahl, Jr.

The fishermen of America have played a unique part in this country's economy since its founding. Fisheries are still of major importance to many sections of the country. Employment, direct and indirect, is furnished to 500,000 citizens. Today our fisheries supply over five billion pounds of fish each year, about half of which is used for human food. The fish catch, when processed, is worth over a billion dollars annually at the retail level.

The commercial fisheries of the Mississippi River are not particularly vital to the total economy of the valley. The present commercial catch of about 80 million pounds, worth eight million dollars, is only a small percentage of the total U. S. catch. Likewise, the 10,000 fishermen are only a small fraction of the total employment of the valley. The commercial fishery nevertheless has contributed materially and steadily to the total benefits derived from the mightiest of rivers. Their worth could be increased materially. When fully developed, and with pollution under control, the commercial fishery of the Mississippi River and her vast tributaries can be expected to produce upwards of a billion pounds of fish annually. This choice animal protein is going to be needed in a few years to feed the world's expanding human population.

Within the area under study commercial fishing activities are confined primarily to Spring Lake in Pool 2, and all of Pools 3 and 4. Carp, buffalo and catfish compose about 67 percent and sheepshead about 30 percent of the annual harvest. The remaining three percent represents eight other species classified as commercial fish. This fishery is economically valuable. More than 1,000,000 pounds of carp and other commercial fish are harvested annually from these pools. In 1961, for example, about 116,000 pounds were seined from the Spring Lake area of Pool 2, and about 104,000 and 1,745,000 pounds were harvested from Pools 3 and 4 respectively.

Our aquatic resources are far more valuable than is indicated by the number of persons they support or the dollar value of their products.

1. They are living, renewable resources which can continue to make their contribution to our welfare forever if we treat them wisely.

2. They enrich our diet with variety.

3. They promote our health, providing dietary supplements such as vitamins, trace minerals, and the essential requirements in wider variety than any other class of foods.

4. They have, because of the unique properties of their proteins and oils, potential uses as pharmaceuticals and industrial chemicals.

5. They supply to our animal industries vital proteins, fats and growth factors.

6. They develop the seafaring qualities of our people and provide marine facilities and equipment sorely needed by an America now faced with transoceanic problems and wide responsibilities in a changing world.

The Fish and Wildlife Act of 1956 recognizes that fish and shellfish are capable of making a valuable continuous contribution to the national economy, food supply and health, recreation, and well being of our citizens. When these resources are properly protected, properly developed, properly managed, and properly utilized, the Act considers them capable of being greatly increased. Control of pollution is one conservation measure that must be practiced. The alternative is destruction by neglect.

It is the National Fish Policy to:

1. Increase and maintain forever, for the people of the United States, a fishery resource capable of yielding the maximum annual product.

2. Strengthen and maintain a vigorous fishery industry by assuring full and fair access to the American market.

3. Do these things in partnership with the States and in full accordance with our international

obligations, and without sacrificing the system of free enterprise.

In pursuing these policies the Federal Government has a responsibility to the public as a whole to see that our fishery resources are utilized to the fullest economic extent without damage to their future productivity.

A deeper look into the complex problems facing our fishing industry today is a look into the major trends operating over decades, that have produced the critical problems now facing us.

Our population growth, the change from rural to urban economy, and industrial development have caused increasing complications: First from domestic wastes, then from dams, industrial wastes, channel and harbor improvements, marsh drainage and conversion of marshlands and backwaters to residential and industrial sites; more recently from the widespread and rapidly expanding use of insecticides, herbicides, detergents, and a host of other technological developments; and now the possible dangers introduced by disposal of radioactive wastes from research, industry and other uses.

Our raw material, the fishes, and the organisms upon which they depend for food, consist of the living resources in rivers, lakes and the sea. They are the property

H. C. Jordahl, Jr.

of no man until caught. In life they are the concern of the people and can be conserved and managed by governmental authority -- local, State, Federal or international. Hidden as they are beneath the surface of the water, special and complicated techniques are needed to find out how they can be managed so as to yield maximum sustained production. Sound management requires an understanding of the nature of living resources. The stocks of fish which support our fisheries are self-renewing. They do not exist in limited quantities, like our mineral resources, to be used once and thereafter be gone forever. Living resources can endure forever, and therefore are more valuable, by far, than the annual yield would suggest. This is true only if we manage them wisely, and we can do this only if we understand the habits of the aquatic animals and plants and their interrelationships with each other and with the environment.

Where the environment becomes changed or restricted by pollution, the fish population and fish food organisms have to adjust themselves to altered conditions. This produces fluctuations of abundance, changes in species composition, changes in growth rate and many other things, most of which do not benefit mankind. This has happened in the Mississippi River where the environment has been changed or rendered unfit by pollution.

H. C. Jordahl, Jr.

The mighty Mississippi River with its many tributaries, can rightfully be included among our nation's major natural resources.. Through the years we have been led to believe that the Mississippi can be little affected by the activities of man. Recent studies and observations show that many sections of this river have been adversely affected by pollution. The severity of the pollution is evidenced by violent fluctuations in species composition by not only fishes but of other aquatic organisms. The choicer fishes are being replaced by less valuable species which have a greater tolerance for turbidity and low oxygen. The gradual accumulation of wastes day after day may render the water a barren wasteland to fish.

Most important to fishery utilization is the capacity of a fish population to restore itself after its numbers have been reduced or changed. For this reason all is not lost. By cleaning up pollution, the restoration of our fishery resources can become a reality. Once again we will be able to see, capture and eat the choicer varieties of fish which are no longer present or are present in limited numbers.

BUREAU OF INDIAN AFFAIRS

In behalf of several Sioux Indian communities, the Bureau of Indian Affairs is interested in the area of the enforcement action on the Mississippi River.

The residents of the Prairie Island Indian Reservation above Dam No. 3 were adversely affected by the oil pollution last spring. The Indian people on this reservation have perpetual use rights to 3,000 acres of Corps of Engineers land adjacent to their reservation and use this area for hunting and fishing. Approximately 86 Indians live here.

The Upper Sioux Community near Granite Falls, Minnesota, and the Lower Sioux Community near Morton, Minnesota, are both situated along the banks and bottoms of the Minnesota River. This river is the major tributary of the Mississippi within the reach of river under study.

Any action that would affect the productivity of the river bottoms, or the quality of the available waters, would have an influence on the Indian people residing on or near the community-owned reservation lands.

The present interests of the Indian people extend to a small portion of the river basin. To these small holdings, these people attach their heritage, freedom, and livelihood. These reservation areas are important to the Bureau of Indian Affairs and to the Indian people who live there.

I believe, turning briefly to the Bureau of Mines, that we have Mr. Bishop, Director of the Bureau of Mines, Minneapolis here. Mr. Bishop.

Adequate supplies of usable water are essential to the mineral industry. As in many other industries, the quantity and quality of available water are vital factors in the development of an economic operation. Consideration for the needs of the mineral industry must be included in a study of the nature being considered. Regulations on water discharges from a mineral-based operation must be consistent with good industry practices and must be based on factual evidence. The Bureau of Mines has the scientific and technologic abilities to assist in studies of the mineral industries with the objective of improving health conditions, increasing safety and efficiency and preventing economic waste.

Within the area under consideration mineral production is confined to sand, gravel, stone and clay. Most of the operating plants in the area require moderate amounts of water for washing and processing. There are no fuels produced in the area under study. In addition to the mining operations, there is a large mineral-based industrial complex at Pine Bend, Minnesota. In this are located an oil refinery, a phosphate fertilizer plant, and an ammonia plant -- all users of substantial quantities of water.

The Bureau has just completed a canvass of the mineral industry to establish water use and water needs of the mineral industry. The study included development of data on the treatment methods in relation to quantity and quality of water discharged from operating plants. These data will be useful in arriving at solutions to water problems which may arise in the mineral industry.

The Bureau of Mines can contribute to the study by identifying number and location of existing mineral-based industries and determining the water requirements, as well as the water discharges, from these establishments. Prediction of future water requirements of the mineral industry are also a province where the Bureau's special abilities can be utilized.

Assistant Secretary of Interior Carver, in a statement on July 8, 1963, stated the following relative to the role of the Bureau of Mines in the pollution control field:

> "Mineral-industry water interests initially conflict with all other major water interests. To ameliorate such conflicts, the Bureau of Mines of this Department encourages the mineral industries to practice water conservation, including water-quality control. In this way, we promote attainment

"of an equitable use balance within the total national demand for water. Water withdrawn from natural supplies must be used over and over where feasible. Waste water effluents must not be allowed to impair significantly the quality of our water supplies.

"Under the provisions of the Bureau of Mines Organic Act, it is both the province and the duty of the Secretary of the Interior to conduct economic inquiries and scientific and technologic investigations among the mineral industries with the aim of improving health conditions, increasing safety and efficiency, and preventing economic waste . . . Close contact with current industrial practices is maintained through activities that include: 1) conduct of cooperative studies with State and other governmental agencies and with industry; 2) participation in the committee work of technical societies; and 3) informal exchanges of information between bureau and industrial specialists in appropriate fields."

GEOLOGICAL SURVEY

The other major bureau of the Department, the Geological Survey, can assist you in the studies and investigations which will be conducted in this reach of the river.

Because this agency can make a major contribution to the study, a separate statement will be submitted at this conference.

CONCLUSION

Mr. Carver in the statement previously noted stressed the essential element of cooperation as follows:

> "In the early days of water resources conservation and development, there was little need for coordination among the various Federal agencies involved. The field was so sparsely occupied, water problems -- especially water-quality problems -- were so relatively less urgent than they are now, that coordination was not then a major consideration. Today, and in the years ahead, close and effective coordination is essential. This Department and other Federal agencies must pool their resources in order to accomplish our goal of acceptable levels of water quality for our natural resources and our economic needs."

On behalf of the Department of the Interior, its agencies and bureaus, and in line with this statement, we assure you that we will make every effort to assist on this study and to achieve a goal of acceptable water quality in the Mississippi River from Anoka, Minnesota, through Lake Pepin.

Thank you, Mr. Chairman.

MR. STEIN: Thank you, Mr. Jordahl, for an excellent statement. I want to thank you particularly for condensing your statement and rushing it to meet our time exigencies. You were right on the nose.

The Department of the Interior, as you know, is one of our closest sister agencies in the Federal establishment, and we work very closely and cooperatively with them, as we do with the Corps of Engineers and several other agencies, on all aspects of water quality.

MR. MUEGGE: Mr. Chairman, could the memorandum agreement that Mr. Jordahl referred to be made part of the appendices of this report?

MR. STEIN: Yes. How long is that, Mr. Jordahl?

MR. JORDAHL: As I recall, it is about four pages.

MR. STEIN: We will put that into the transcript for easy reference.

(The documents submitted for inclusion in the record by Mr. Jordahl are as follows:

FISH AND WILDLIFE COORDINATION ACT*

(*The Act of March 10, 1934, 48 Stat. 401, as amended by the Act of August 14, 1946, 60 Stat. 1080; the Act of June 19, 1948, 62 Stat. 497; and the Act of August 12, 1958, 72 Stat. 563; 16 U.S.C. 661 et seq.

*The latest revision (Act of August 12, 1958) establishes the official title of this legislation as the "Fish and Wildlife Coordination Act"; it also revised the first four sections of thelegislation and contains an authorization for appropriations.

The following compilation of provisions of the Fish and Wildlife Coordination Act has been prepared for convenient reference:

SEC. 1. For the purpose of recognizing the vital contribution of our wildlife resources to the Nation, the increasing public interest and significance thereof due to expansion of our national economy and other factors, and to provide that wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs through the effectual and harmonious planning, development, maintenance, and coordination of wildlife conservation and rehabilitation for the purposes of this Act in the United States, its Territories and possessions, the Secretary of the Interior is authorized (1) to provide assistance to, and cooperate with, Federal, State, and public or private agencies and organizations in the development, protection, rearing, and stocking of all species of wildlife, resources thereof, and their habitat, in controlling losses of the same from disease or other causes, in minimizing damages from overabundant species, in providing public shooting and fishing areas, including easements across public lands for access thereto, and in carrying out other measures necessary to effectuate the purposes of this Act; (2) to make surveys and investigations of the wildlife of the public domain, including lands and waters or interests therein acquired or controlled by any agency of the United States; and (3) to accept donations of land and contributions of funds in furtherance of the purposes of this Act.

SEC. 2 (a) Except as hereafter stated in subsection (h) of this section, whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the United States, or by any public or private agency under Federal permit or license, such department or agency first shall consult with the United States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular State wherein the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water-resource development.

(b) In furtherance of such purposes, the reports and recommendations of the Secretary of the Interior on the wildlife aspects of such projects, and any report of the head of the State agency exercising administration over the wildlife resources of the State, based on surveys and investigations conducted by the United States Fish and Wildlife Service and such State agency for the purpose of determining the possible damage to wildlife resources and for the purpose of determining means and measures that should be adopted to prevent the loss of or damage to such wildlife resources, as well as to provide concurrently for the development and improvement of such resources, shall be made an integral part of any report prepared or submitted by any agency of the Federal Government responsible for engineering surveys and construction of such projects when such reports are presented to the Congress or to any agency or person having the authority or the power, by administrative action or otherwise, (1) to authorize the construction of water-resource development projects or (2) to approve a report on the modification or supplementation of plans for previously authorized projects, to which this Act agiies. Recommendations of the

Secretary of the Interior shall be as specific as is practicable with respect to features recommended for wildlife conservation and development, lands to be utilized or acquired for such purposes, the results expected, and shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages. The reporting officers in project reports of the Federal agencies shall give full consideration to the report and recommendations of the Secretary of the Interior and to any report of the State agency on the wildlife aspects of such projects, and the project plan shall include such justifiable means and measures for wildlife purposes as the reporting agency finds should be adopted to obtain maximum overall project benefits.

(c) Federal agencies authorized to construct or operate water-control projects are hereby authorized to modify or add to the structures and operations of such projects, the construction of which has not been substantially completed on the date of enactment of the Fish and Wildlife Coordination Act, and to acquire lands in accordance with section 3 of this Act, in order to accommodate the means and measures for such conservation of wildlife resources as an integral part of such projects: Provided, That for projects authorized by a specific Act of Congress before the date of enactment of the Fish and Wildlife Coordination Act (1) such modification or land acquisition shall be compatible with the purposes for which the project was authorized; (2) the cost of such modifications or land acquisition, as means and measures to prevent loss of and damage to wildlife resources to the extent justifiable, shall be an integral part of the cost of such projects; and (3) the cost of such modifications or land acquisition for the development or improvement of wildlife resources may be included to the extent justifiable, and an appropriate share of the cost of any project may be allocated for this purpose with a finding as to the part of such allocated cost, if any, to be reimbursed by non-Federal interests.

(d) The cost of planning for and the construction or installation and maintenance of such means and measures adopted to carry out the conservation purposes of this section shall constitute an integral part of the cost of such projects: Provided, That such cost attributable to the development and improvement of wildlife shall not extend beyond those necessary for (1) land acquisition, (2) modification of the project, and (3) modification of project operations; but shall not include the operation of wildlife facilities nor the construction of such facilities beyond those herein described: And provided further, That, in the case of projects authorized to be constructed, operated, and maintained in accordance with the Federal reclamation laws (Act of June 17, 1902, 32 Stat. 388, and Acts amendatory thereof or supplementary thereto), the Secretary of the Interior, in addition to allocations made under Section 9 of the Reclamation Project Act of 1939 (53 Stat. 1187), shall make findings on the part of the estimated cost of the project which can properly be allocated to means and measures to prevent loss of and damage to wildlife resources, which costs shall not be reimbursable, and an appropriate share of the project costs may be allocated to development and improvement of wildlife resources, with a finding as to the part of such allocated costs, if any, to be reimbursed by non-Federal fish and wildlife agencies or interests.

(e) In the case of construction by a Federal agency, that agency is authorized to transfer to the United States Fish and Wildlife Service, out of appropriations or other funds made available for investigations, engineering, or construction, such funds as may be necessary to conduct all or part of the investigations required to carry out the purposes of this section.

(f) In addition to other requirements, there shall be included in any report submitted to Congress supporting a recommendation for authorization of any new project for the control or use of water as described herein (including any new division of such project or new supplemental works on such project) an estimation of the wildlife benefits or losses to be derived therefrom including benefits to be derived from measures recommended specifically for the development and improvement of wildlife resources, the cost of providing wildlife benefits (including the cost of additional facilities to be installed or lands to be acquired specifically for that particular phase of wildlife conservation relating to the development and improvement of wildlife), the part of the cost of joint-use facilities allocated to wildlife, and the part of such costs, if any, to be reimbursed by non-Federal interests.

(g) The provisions of this section shall be applicable with respect to any project for the control or use of water as prescribed herein, or any unit of such project authorized before or after the date of enactment of the Fish and Wildlife Coordination Act for planning or construction, but shall not be applicable to any project or unit thereof authorized before the date of enactment of the Fish and Wild-Life Coordination Act if the construction of the particular project or unit thereof has been substantially completed. A project or unit thereof shall be considered to be substantially completed when sixty percent or more of the estimated construction cost has been obligated for expenditure.

(h) The provisions of this Act shall not be applicable to those projects for the impoundment of water where the maximum surface area of such impoundments is less than ten acres, nor to activities for or in connection with programs primarily for land management and use carried out by Federal agencies with respect to Federal lands under their jurisdiction.

SEC. 3. (a) Subject to the exceptions prescribed in section 2 (h) of this Act, whenever the waters of any stream or other body of water are impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the United States, adequate provision, consistent with the primary purposes of such impoundment, diversion, or other control, shall be made for the use thereof, together with any areas of land, water, or interests therein, acquired or administered by a Federal agency, in connection therewith, for the conservation, maintenance, and management of wildlife resources thereof, and its habitat thereon, including the development and improvement of such wildlife resources pursuant to the provisions of section 2 of this Act.

(b) The use of such waters, land, or interests therein for wildlife conservation purposes shall be in accordance with general plans approved jointly (1) by the head of the particular department or agency exercising primary administration in each instance, (2) by the Secretary of the Interior, and (3) by the head of the agency exercising the administration of the wildlife resources of the particular State wherein the waters and areas lie. Such waters and other interests shall be made available, without cost for administration, by such State agency, if the management of the properties relate to the conservation of wildlife other than migratory birds, or by the Secretary of the Interior, for administration in such manner as he may deem advisable, where the particular properties have value in carrying out the national migratory bird management program: Provided, That nothing in this section shall be construed as affecting the authority of the Secretary of Agriculture to cooperate with the States or in making lands available to the States with respect to the management of wildlife and wildlife habitat on lands administered by him.

(c) When consistent with the purposes of this Act and the reports and findings of the Secretary of the Interior prepared in accordance with section 2, land, waters, and interests therein may be acquired by Federal construction agencies for the wildlife conservation and development purposes of this Act in connection with a project as reasonably needed to preserve and assure for the public benefit the wildlife potentials of the particular project area: Provided, That before properties are acquired for this purpose, the probable extent of such acquisition shall be set forth, along with other data necessary for project authorization, in a report submitted to the Congress, or in the case of a project previously authorized, no such properties shall be acquired unless specifically authorized by Congress, if specific authority for such acquisition is recommended by the construction agency.

(d) Properties acquired for the purposes of this section shall continue to be used for such purposes, and shall not become the subject of exchange or other transactions if such exchange or other transaction would defeat the initial purpose of their acquisition.

(e) Federal lands acquired or withdrawn for Federal water resource purposes and made available to the States or to the Secretary of the Interior for wildlife management purposes, shall be made available for such purposes in accordance with this Act, notwithstanding other provisions of law.

(f) Any lands acquired pursuant to this section by any Federal agency within the exterior boundaries of a national forest shall, upon acquisition, be added to and become national forest lands, and shall be administered as a part of the forest within which they are situated, subject to all laws applicable to lands acquired under the provisions of the Act of March 1, 1911 (36 Stat. 961), unless such lands are acquired to carry out the National Migratory Bird Management Program.

SEC. 4. Such areas as are made available to the Secretary of the Interior for the purposes of this Act, pursuant to sections 1 and 3 or pursuant to any other authorization, shall be administered by him directly or in accordance with cooperative agreements entered into pursuant to the provisions of the first section of this Act and in accordance with such rules and regulations for the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, as may be adopted by the Secretary in accordance with general plans approved jointly by the Secretary of the Interior and the head of the department or agency exercising primary administration of such areas: Provided, That such rules and regulations shall not be inconsistent with the laws for the protection of fish and game of the States in which area is situated (16 U.S.C., sec. 664): Provided further, That lands having value to the National Migratory Bird Management Program may, pursuant to general plans, be made available without cost directly to the State agency having control over wildlife resources, if it is jointly determined by the Secretary of the Interior and such State agency that this would be in the public interest: And provided further, That the Secretary of the Interior shall have the right to assume the management and administration of such lands in behalf of the National Migratory Bird Management Program if the Secretary finds that the State agency has withdrawn from or otherwise relinquished such management and administration.

SEC. 5. The Secretary of the Interior, through the Fish and Wildlife Service and the Bureau of Mines, is authorized to make such investigations as he deems necessary to determine the effects of domestic sewage, mine, petroleum, and industrial wastes, erosion, silt, and other polluting substances on wildlife, and to make reports to the Congress concerning such investigations and of recommendations for alleviating dangerous and undesirable effects of such pollution. These investigations shall include (1) the determination of standards of water quality for the maintenance of wildlife; (2) the study of methods of abating and preventing pollution, including methods for the recovery of useful or marketable products and byproducts of wastes; and (3) the collation and distribution of data on the progress and results of such investigations for the use of Federal, State, municipal, and private agencies, individuals, organizations, or enterprises.

SEC. 5A. In the management of existing facilities (including locks, dams, and pools) in the Mississippi River between Rock Island, Illinois, and Minneapolis, Minnesota, administered by the United States Corps of Engineers of the Department of the Army, that Department is hereby directed to give full consideration and recognition to the needs of fish and other wildlife resources and their habitat dependent on such waters, without increasing additional liability to the Government, and, to the maximum extent possible without causing damage to levee and drainage districts, adjacent railroads and highways, farm lands, and dam structures, shall generally operate and maintain pool levels as though navigation was carried on throughout the year.

SEC. 6. There is authorized to be appropriated from time to time, out of any money in the Treasury not otherwise appropriated, such amounts as may be necessary to carry out the provisions of this Act and regulations made pursuant thereto, including the construction of such facilities, buildings, and other improvements necessary for economical administration of areas made available to the Secretary of the Interior under this Act, and the employment in the city of Washington and elsewhere of such persons and means as the Secretary of the Interior may deem necessary for such purposes.

SEC. 7. Any person who shall violate any rule or regulation promulgated in accordance with this Act shall be guilty of a misdemeanor and upon conviction thereof shall be fined not more than $500 or imprisoned for not more than one year, or both.

SEC. 8. The terms "wildlife" and "wildlife resources" as used herein include birds, fishes, mammals, and all other classes of wild animals and all types of aquatic and land vegetation upon which wildlife is dependent.

SEC. 9. The provisions of this Act shall not apply to the Tennessee Valley Authority.

Bureau of Sport Fisheries and Wildlife
Branch of Management and Enforcement
Feb. 1962 3112

* * * * * *

Memorandum of Understanding Between the Department of the Interior (Fish and Wildlife Service) and the Department of Health, Education, and Welfare (Public Health Service) Relative to Control of Water Pollution

WHEREAS the Department of the Interior is charged by the Fish and Wildlife Act of 1956 with the responsibility for all matters primarily relating to fisheries: and

NOW therefore in the interests of public health, efficiency, and economy, to insure that water pollution control and fishery activities of the Federal Government will be closely coordinated, and for the purpose of delineating their respective functions, the Fish and Wildlife Service and the Public Health Service mutually agree as follows:

The Public Health Service will invite the Fish and Wildlife Service to participate in Public Health Service water quality investigations and studies involving the well-being of fish and fisheries.

The Fish and Wildlife Service will invite the Public Health Service to participate in fishery investigations and studies or studies involving water quality.

The agency first informed of large fish kills will immediately request the other to participate in any investigation made by it.

Whenever any ad hoc or standing committee involving both fishery resources and pollution is established by either agency, the other agency will be invited to nominate a representative to sit on the committee as a regular member.

Each agency will designate a staff member to maintain continuing liaison with the other agency for the purpose of coordinating program matters of mutual interest

Hatfield Chilson (s)	M. B. Folsom (s)
Acting Secretary of the Interior	Secretary of Health, Education, and Welfare
May 22, 1958	July 24, 1958

* * * * * *

MR. STEIN: If there is nothing further at this time, because of commitments which have been made we will now recess for lunch until two o'clock.

(Whereupon a luncheon recess was taken.)

Reproduced from best available copy.

AFTERNOON SESSION

2:00 p.m.

MR. STEIN: We have a telegram here we would like to put into the record, addressed to us from Congressman Fraser. It reads:

"May I add my support as Congressman for Minneapolis to the call for action to stop pollution of the waters of the Upper Mississippi and Minnesota Rivers. Sewage and waste are a danger to public health...bring contamination and death to fish and wildlife, and are a threat to recreational use of these rivers. I have reviewed the report of Senior Sanitary Engineer, J. M. Rademacher, and agree with his conclusion that, 'The effects of pollution this stretch of water are so great as to require remedial action.'

"In his 1965 budget, President Johnson is asking Congress for 900 new grants for waste treatment works and an increase of $5 million above the 1964 figure of $29 million for water supply and water pollution control activities. The President certainly wants action to clean up the waters of America.

"It took the death of 10,000 ducks to ring the alarm bell for us in Minnesota. Now the cities, the

"States of Wisconsin and Minnesota and the Federal Government must act together to rid our rivers of filth, scum and debris. Your help will be appreciated.

/s/ Donald M. Fraser."

May we have the Federal representatives? Perhaps we may want to finish with the Department of the Interior's presentation first, before we ask questions.

MR. JORDAHL: Could we finish that, Mr. Chairman?

MR. STEIN: Surely.

MR. POSTON: Mr. Wilson from the United States Geological Survey.

MR. JORDAHL: Mr. Wilson is Division Hydrologist, Mid-Continent Area, Geological Survey.

STATEMENT OF HARRY WILSON, DIVISION HYDROLOGIST, MID-CONTINENT AREA, UNITED STATES GEOLOGICAL SURVEY, ST. LOUIS, MISSOURI

MR. WILSON: Mr. Chairman, conferees, ladies and gentlemen:

I have submitted a prepared statement for the record, but I would like to depart from that statement and condense the highlights of it in the interests of time. This I plan to do with the aid of two slides.

MR. STEIN: Pardon me. Your statement will appear as if read in the record.

MR. WILSON: All right, fine.

The purpose of making this presentation is to stress the complexity of water resources investigation, the contributions that the Geological Survey can make to these investigations, and the necessity for coordinated planning on the part of all interested in water resources investigations and the protection of quality.

May I have the first slide, please?

Now, you are looking at a rather uncomplicated hydrologic system, because man has just begun to develop this particular hypothetical basin. Here the survey can contribute, as it does even in complicated basins, three products that are of great interest to any study.

The first product, of course, is a topographic map in which we map the surface contours, take care of the features that are shown, and other physical features that would appear on a finished map. These maps, of course, have great usefulness in investigations, as everyone knows.

The second product that we can contribute is a geologic map in which we also map the surface, but this time concentrate on the geologic deposits as they outcrop on the surface.

These maps would also carry with them cross-sections that would show the subsurface geology that is in place. But the products that are most useful to the study of water are the products from our Water Resources Division, which are the water resources reports of investigation. These reports unite the topography, the geology and the hydrology into a coherent whole, so that the physical system as it sits there in place is fully described.

The first question that would arise from this type of work is, where is the water, what quantity is available and what is its quality? Our Surface Water Branch measures the stream flow and makes a study of the variabilities of that flow. The Ground Water Branch actually works out the dimensions of the ground water container and spells out the way in which the water occurs within this framework.

The Quality of Water Branch takes care of getting an assessment of the quality in both the surface and the ground waters.

Now, this is a relatively simple case, but let's look at the next slide, where our basin has become of age.

We now have a completely new set of conditions. We still have the same framework; we still have the same stream; but what man has done in this basin has posed many problems for us.

The dam at the headwaters, for instance, provides power, recreation and flood control, but it also poses a host of problems downstream from the dam because it has changed the regimen of the stream. The city uses water from the stream course, but it also uses the stream course as a sewer, dumping its sanitary refuse back into the stream.

The industrial plants along the way take water either from the ground water resource or from the surface water resource, and then dump their waste into one or the other, contaminating one or the other, or both.

We now have a complex problem. We no longer have the simple one that was shown in the first slide. We no longer can be content with the questions of where is it, how much is there, and what is its quality. We now must have an understanding of the complete operation of this system, and what the effect of man's activities is upon that stream. Everything a user does in this basin probably affects another user and, therefore, complete understanding is necessary.

To do this requires a talented team of specialists. It takes geologists, mathematicians, hydrologic engineers, geophysicists, and a host of other talents to come up with a complete answer to have this basin operate. Only in this way will we be able to come up with a management plan that will both develop the waters to their optimum usefulness and protect them in their quality at the same time.

The Survey is working in Minnesota and Wisconsin in a number of studies like this, and all of these are listed in the prepared statement which I have submitted to the record.

The maps attached to that record show the places in which we are stream-gauging, measuring observation wells, and where our individual basin studies similar to this hypothetical basin that you are looking at are taking place.

The point that I would like to leave you with, however, is that the study of a hydrologic system such as this and its quality is a very complex thing. If the geologist worked by himself, he is likely to become so enamored with the geology that he can't see the water picture.

If the chemist worked collecting samples and analyzing the samples, without knowing the flow patterns and the movement, he can do little towards warning people of what the potentialities for pollution are.

I would like to urge, therefore, that all agencies, interested parties, and particularly the people working in a scientific field that have this special talent, cooperate more and closer than we ever have in the past in order to provide the best possible solutions that we can to these basins.

I submit herewith my prepared statement.

Activities of the U. S. Geological Survey in the Upper Mississippi River Basin
Minnesota and Wisconsin

The products of the U. S. Geological Survey which contribute to the scientific physical background for pollution control are of three general types. These are:

(1) topographic maps, (2) basic geologic maps and reports, and (3) hydrologic reports measuring and describing water as it occurs and moves within its natural environment with continually changing quantity and quality.

Topographic maps are used by water resources specialists as a source of many physical facts concerning the size, shape, and slope of river systems. They are used also to locate and record the points of diversion of stream waters and return of waste waters to the stream. Adequate topographic maps are available for approximately 50 percent of the area under consideration today.

Geologic maps show the rock types and structure over and through which water moves. They provide an explanation of why some channels are water-tight whereas others allow movement of water between the stream bed and adjacent permeable water-bearing formations. They are useful in delineating the shape of ground-water bodies and in determining the direction of ground-water movement.

Information contained in these maps and descriptive geologic reports provide valuable background references for water resources studies but it is the Survey's hydrologic data and water resource reports that relate more directly to the control of water pollution.

The water resources reports of the Geological

Survey are designed to meet a need in development, use or management of water, and although not specifically designed for pollution activities, the information they contain has direct value in pollution studies. This information includes both the quantity and the quality of surface and underground water, the relation of water on the surface to that underground and the influence of natural and man-made controls on water You will be interested in specific studies in this area that provide this kind of information.

In the Upper Mississippi River Basin, basic information on streamflow has been obtained for a number of years by means of surface water gaging network. There are at present 54 stations (see map) in the network that give a picture of quantity and variability of streamflow. The earliest streamflow information in the Upper Mississippi Basin was collected in 1903 on the Minnesota River at Mankato. Information on quantities of water available throughout the year is useful to water managers in determining the available supply and the appropriate level of discharge of waste in the stream systems. The information is essential in determining loads of pollutants transported over a period of time and is necessary in determining the amount of water available for dilution of a pollutant that might be spilled accidentally. The United States Public

Health Service, the Minnesota Water Pollution Control Commission, the Minnesota Department of Health, and the Minneapolis-St. Paul Sanitary District, among others, have used streamflow information collected by the Geological Survey in their reports on pollution.

The first Geological Survey report on water quality in Minnesota was published in 1907 as Water-Supply Paper 193. This report, prepared in cooperation with the State Board of Health and the University of Minnesota, contained information on the mineral quality of the water and on industrial and municipal pollution, including bacterial pollution, at many locations throughout the State.

Chemical quality of the surface waters is measured in a program closely tied to the streamflow program because quality changes with changes in streamflow. At the present time, a statewide quality of water network is carried on in cooperation with the Minnesota Division of Waters.

Although the present network is concerned principally with the chemical quality of water, some information on sediment content and temperatures of the water are obtained also. Information on significant dissolved minerals, which may include some dissolved solids from industrial and domestic wastes, is being obtained at

16 locations (see map) in the Upper Mississippi Basin. Information is available at some locations on radioactivity of waters, trace elements, detergents, sediment content and temperature of surface and ground waters.

A series of studies started last July in cooperation with the Minnesota Division of Waters will describe the hydrology of the watershed units of the State and will provide hydrologic knowledge on which administrative, political and economic decisions can be made. Particular attention will be given to areas in which water supply problems can be anticipated and areas where known usable water supplies can be increased. The studies will include information on the quantity and quality of low flows of the streams, the location and extent of aquifers, changes in water levels (63 measurement points - see map), the pattern of movement of ground water, quality of ground waters, areas of exceptionally high pick-up of ground water by streams, and areas where streamflow is particularly contaminated by ground-water inflow of poor quality. These watershed studies are closely related to the streamflow, ground-water level, and water quality networks mentioned previously.

Scheduled for completion prior to January 1965 are reports on the Big Stone and the Pomme de Terre watersheds (see map). Reports on two other watersheds in the Upper Mississippi Basin are scheduled for completion by January 1966.

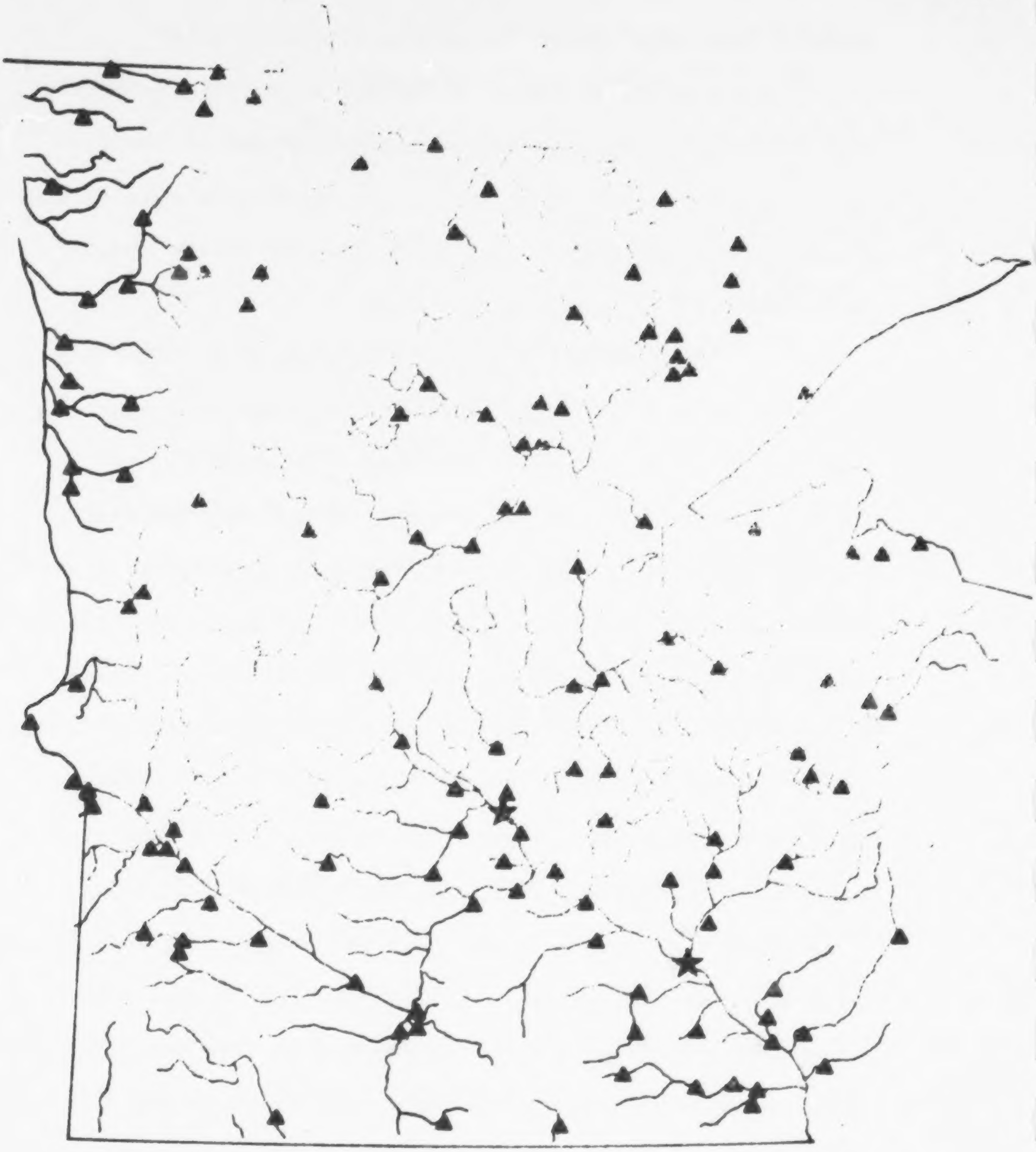
The information contained in these watershed reports will be useful to water developers and managers who are charged with development and conservation of water as a resource and who must be concerned with all aspects of water and its environment, whether it be natural or man-made.

In addition to the basic data and knowledge just described, information has been obtained in specific studies that are of value in pollution control and abatement. For example, to protect public water supplies, the Geological Survey was asked to predict the concentration and time of arrival of a contaminant in the event of an accidental reactor "spill" at the Elk River Reactor Site. The Survey mapped the distribution of permeable surface deposits through which a "spill" might migrate, and estimated the time of travel through these deposits to a surface water source of the Mississippi. Surface water flow rates were computed and a graph showing the distribution of concentrations of a contaminant was related to the time of travel studies. From these relations, the anticipated time of arrival of a contaminant and its concentration at the St. Paul water intake was estimated. This is an excellent example of the complex knowledge needed in dealing with many water problems where the relation of surface water to ground water, the rates of movement of water underground and on the surface, as well as the relationship of concentration to streamflow must be understood in arriving at information needed for protection of a source of supply.

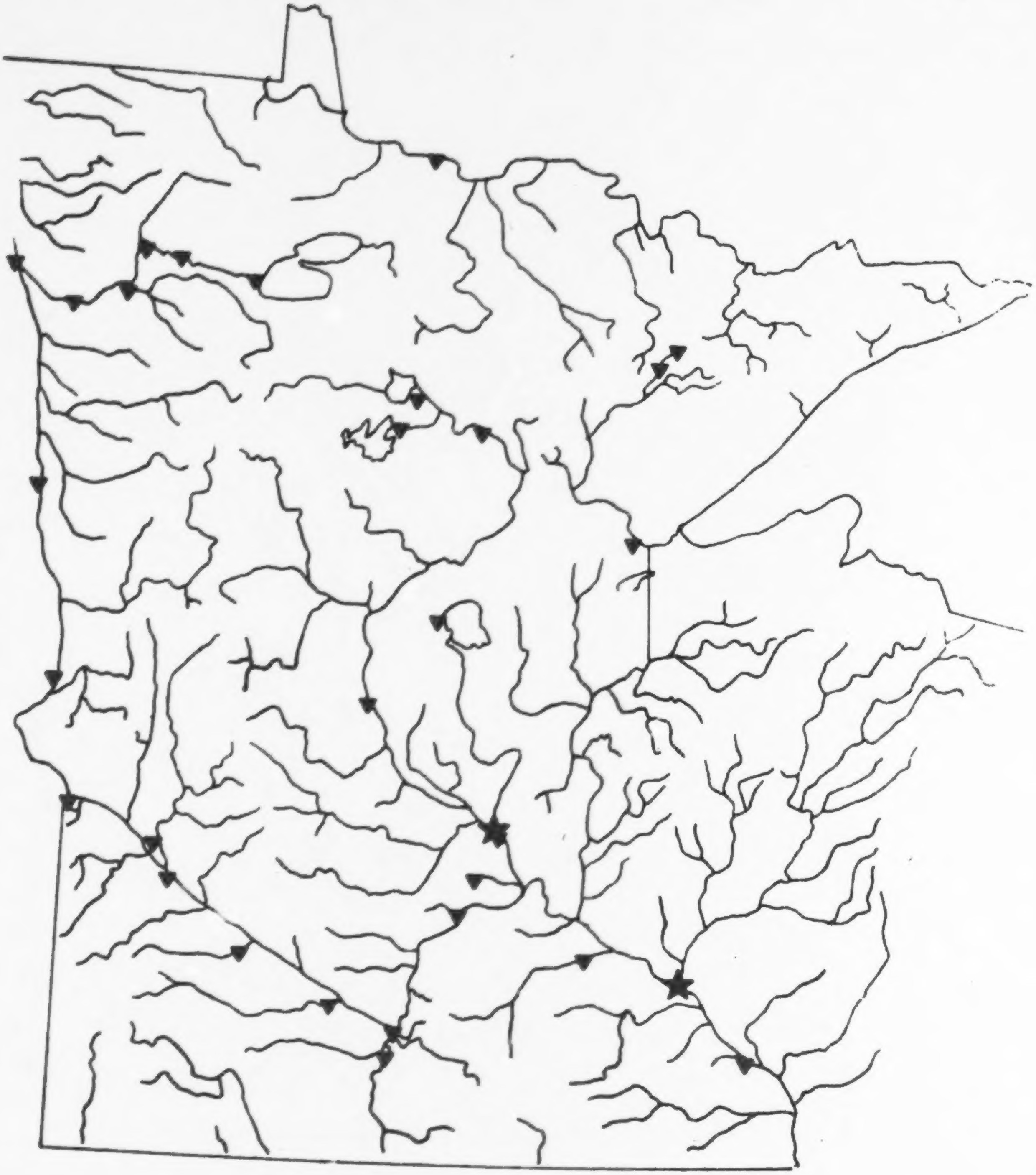
The Geological Survey's purpose is to determine and continuously evaluate, without bias, the quantity, quality and distribution of the water resources of the United States. Its trained corps of people in each State, working on fact-finding programs designed cooperatively with State and local agencies and other Federal agencies, provide knowledge of water and its environment that is of primary importance in consideration of all aspects of water development, use and conservation, including pollution abatement. Because the Survey's programs are planned in conjunction with State and Federal agencies, the programs provide timely and appropriate water facts as needed. The results, of course, are available to all in the form of maps and reports. The Geological Survey desires to continue this cooperation with Federal and State agencies in order to provide the best possible information for the optimum development of our water resources.

(The maps referred to are as follows:)

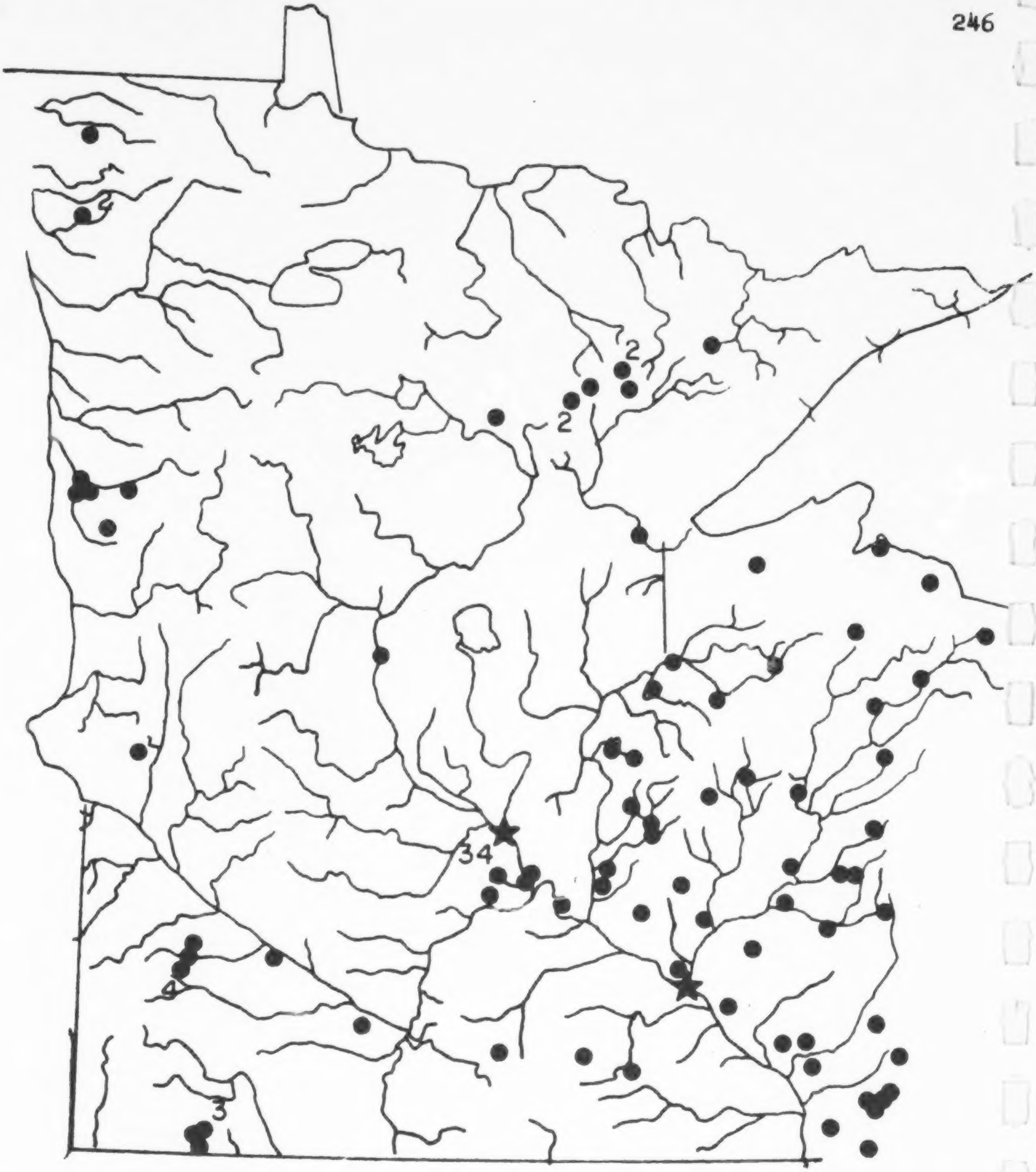
14mr



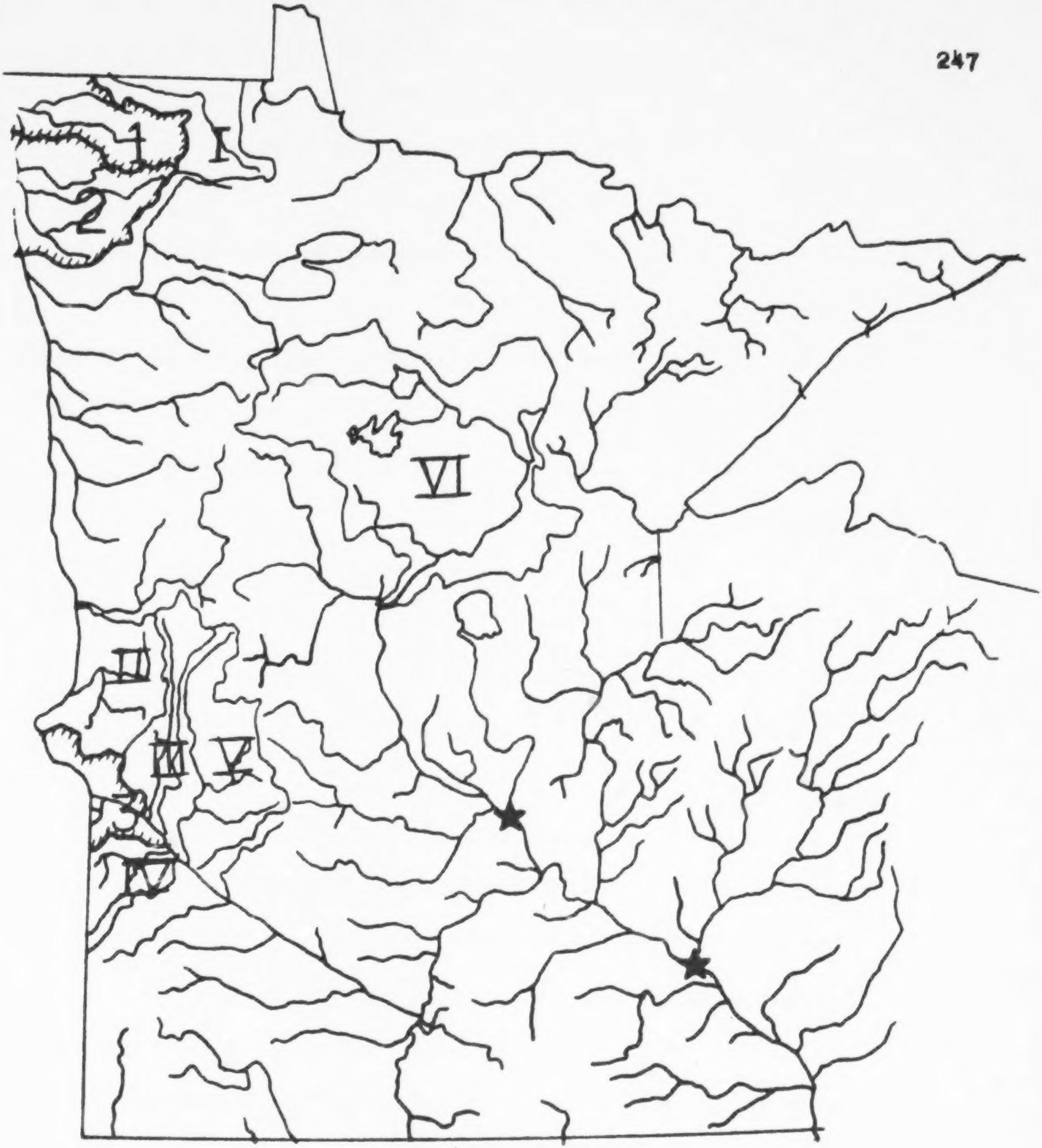
Location of gaging stations.--to determine stage and discharge of streams



Location of network stations.--to determine mineral quality of streams



Location of observation wells.--to determine water level changes (number shows multiple wells in one area)



WATER RESOURCES STUDIES

Currently under study:
1. Two Rivers Basin
2. Middle River Basin
3. Big Stone River Basin

Scheduled for study in 1965-66:
I. Roseau River Basin
II. Mustinka River Basin
III. Pomme de Terre River Basin
IV. Lac qui Parle River Basin
V. Chippewa River Basin
VI. Mississippi Headwaters River Basin

☆ Section of Mississippi River between Anoka and Lake Pepin

MR. STEIN: Thank you very much.

(Applause.)

MR. STEIN: Are there any questions for any of the Interior people?

MR. WISNIEWSKI: Mr. Chairman, inasmuch as some of the people, in presenting their material, are not reading their papers in full, I would like to ask Mr. Wilson a question.

Do these two slides actually contain the meat of your statement?

MR. WILSON: No. The prepared statement is rather dull and it covers what we are doing and where we are working, and things like that.

MR. WISNIEWSKI: You realize, of course, that the conferees are going to have to consider whatever was presented here in arriving at conclusions, and we are expected to do that at the close of the conference.

Will you excuse us if we fail to take into consideration some of the things you say in your paper which were not read?

MR. WILSON: Would you like me to submit a statement comparable to the one I just made? If that would help, I would be glad to do that.

MR. WISNIEWSKI: Because we wouldn't want to be accused of having left out something.

MR. WILSON: I will do that. Where will I address that to?

MR. STEIN: We have to have it pretty soon.

MR. WILSON: I can give it to you pretty soon.

MR. STEIN: All right.

DR. HARGRAVES: I don't think that is what he had in mind.

MR. STEIN: He wants it before we arrive at our conclusions, presumably tomorrow.

MR. JORDAHL: Well, isn't the question, Mr. Chairman, the difference between what was presented verbally and what was presented in the prepared statement? We can provide copies of the prepared statement to all of you right now.

MR. STEIN: Right.

MR. WILSON: The prepared statement says about the same thing and it is in rather dull language. I think you can read the same message in the prepared statement, but I didn't choose to read it, because I preferred to do it with these slides.

MR. STEIN: In other words, as I understand you, Mr. Wilson, and I don't want to stretch this out -- the first question that Mr. Wisniewski asked was if the report presented with these two slides really summarized your prepared statement. The answer to that is yes, it does?

MR. WILSON: Yes.

MR. MUEGGE: I would like to ask Mr. Wilson whether the efforts of the United States Geological Survey in any way duplicate any of the other Federal activities?

MR. WILSON: We hope not. We work in cooperation with the States, as most of you know, and we work in very close cooperation with the Corps of Engineers in many places, and also with the Department of Health, Education, and Welfare. On the working level there is very little duplicating.

MR. STEIN: Are there any further questions of the Interior Department people?

(No response.)

MR. STEIN: If not, Mr. Poston?

MR. POSTON: Colonel L. B. Harding, District Engineer of the United States Army, Corps of Engineers.

STATEMENT OF LIEUTENANT COLONEL L. B. HARDING, DISTRICT ENGINEER, UNITED STATES ARMY, CORPS OF ENGINEERS

COLONEL HARDING: Mr. Chairman, conferees, ladies and gentlemen:

I appreciate the opportunity afforded me today to present the role of the Corps of Engineers in pollution abatement and particularly in that area of the Upper Mississippi River between its confluence with the Rum River and the lower end of Lake Pepin, which lies within the St. Paul Engineer District.

In the brief time allotted me this morning, I plan to discuss the responsibilities of the Corps in pollution abatement, or as more generally described, water quality control, and the actions taken by the St. Paul District to discharge these functions.

In 1824, the Congress of the United States assigned to the Corps of Engineers the responsibility for developing the nation's rivers and harbors. Since that time, the work of the Corps, in carrying out the policies of the Congress in developing water resources has greatly increased and expanded in complexity. Pollution control developed as a fringe benefit in carrying out our primary duties in the area of developing rivers and harbors for navigation until 1961 when the passage of the Water Pollution Control Act Amendments (P.L. 87-88) spelled out the Corps' mission in this field.

Since the initial responsibility of the Corps was in navigation and navigable streams, early Acts concerned with pollution passed by the Congress were oriented toward protecting navigation from obstruction and injury. For example, Section 13 of the River and Harbor Act of 1899, "... prohibits the discharge into navigable waters generally of refuse matter other than liquid sewage, including the discharge of those materials which are obstructive or injurious to navigation...". Note the Act specifically excludes "liquid sewage", which, of course, constitutes one of the principal pollutants. Also, no mention is made of oil. The Oil Pollution Act of 1924 applies to the discharge of oil into coastal waters and does not apply to inland waters as found in this District. However, oil discharged from vessels has been held by the courts to be refuse matter and therefore its discharge into navigable waters of the United States is a violation of Section 13 of the 1899 Act. In accordance with our primary interest in the field of navigation, enforcement has been directed toward prevention of pollution, including oil, that will impede or injure navigation.

The overall policy of the Corps has been directed toward prevention of violations of the law rather than remaining passive until a violation has occurred and then seeking prosecution. Experience has demonstrated that public education through the media of press releases, navigation bulletins, and television broadcasts is the most effective means of getting the story across. Should these means fail and pollutions occur, as happens, the Chief of Engineers considers the seriousness of the pollution, the degree of culpability, cooperation in clean-up or corrective operations and the past record of the violator, in determining whether prosecution is recommended to the Department of Justice. If the investigation and study of an occurrence indicates a basis for prosecution, the facts of the case are referred to the Department of Justice with the recommendation that the proper legal action be taken.

Also included in the 1899 Act is the authority for issuance of permits for construction of wharfs, piers, dolphins, etc., with principal consideration for issuance as to whether such structures present an unreasonable obstruction to navigation. The Corps does give particular attention to outfall sewers from industrial establishments and, as in the case for all permits, refers them to interested State and local authorities for comment.

As already stated, the Corps' early contributions to pollution abatement resulted from its responsibilities for navigable waterways. However, with the passage of the Water Pollution Control Act Amendments of 1961, which is administered by the Secretary of Health, Education, and Welfare, the Corps' responsibilities for pollution abatement are more clearly defined. This Act, "... provides that, in the survey or planning of any reservoir by the Corps of Engineers, Bureau of Reclamation, or other Federal Agency, consideration shall be given to inclusion of storage for regulation of stream flow for the purpose of water quality control...". This legislation requires that, "... such storage and water releases shall not be provided as a substitute for adequate treatment or other means of controlling waste at the source...". The need and value of such storage for regulation of stream flow is determined with the advice of the Secretary of Health, Education, and Welfare, and his views are set forth in any report or presentation to Congress proposing authorization or construction of projects, including water quality control. This authority applies to all Corps reservoir projects being considered in survey investigations, with a view to recommendation for authorization and those being planned for construction subsequent to authorization.

These, then, are the principal responsibilities and authorities of the Corps in pollution abatement. Permit me now to consider the activities of the St. Paul District in implementing these general areas of responsibility.

First, in administering the 1899 Act, the District issues public notices to the press, commercial navigation interests, recreational boaters, marinas, Federal and State agencies, and industrial plants along the Mississippi River, at two-year intervals. These notices recite Federal statutes prohibiting pollution and the penalty for violation. Recipients of these notices are asked to assist in preventing pollution and to report immediately any violations which come to their attention. Further, at the start of each new navigation season, the District Engineer or his representative may appear on local television programs and explain the anti-pollution program.

Second, the District investigates instances of reports of pollution or potential sources of pollution which may be reported by its own personnel on plant or at locks or dams, or by other interested parties.

Since 1957, 31 instances of oil and refuse pollution have been investigated by the District Eighteen of those involved minor, unwillful spillages in which the violators were warned against further spillage. In eleven other cases, the offender removed the source of pollution upon request. The two remaining cases which occurred last spring and, in effect, resulted in this conference, have been referred to the United States Attorney.

This is the participation by the District in implementing the provisions of the Water Pollution Control Act Amendments of 1961 through reservoir storage. The District, in cooperation with other Districts of the North Central Division, Corps of Engineers, is engaged in a comprehensive water resource study covering the Upper Mississippi Basin above the Ohio River This study will give particular attention to the projected economic growth of the region and the related future water needs, including reservoir requirements for water quality improvement.

In addition, we have under way a review of current operating procedures for the Mississippi River headwaters reservoirs to determine the advisability of any changes to meet the foreseeable water supply and water quality needs in the vicinity of and below the Twin Cities, as well as other water uses. Also, we have pending a detailed review of the water resource improvements, including additional storage reservoirs, which may be practical and economically feasible in the Minnesota River Basin.

Finally, I should like to mention briefly our participation in a research program which may be overlooked in our quest for better water. I am referring to the Interagency Sedimentation project located at the St. Anthony Falls Laboratory of the University of Minnesota and includes participants of interested Government agencies. This program, designed to develop improved sediment sampling devices and simplified methods of sediment sampling is under the general supervision of the Chief of Engineering Division, St. Paul District. The improvement of physical characteristics is important in water quality control and it is anticipated that this research program will eventually contribute to a better understanding of these characteristics.

In conclusion, the Corps will continue to vigorously discharge its responsibilities in administering the Federal statutes which have been enacted by the Congress for protection and preservation of the navigable waters of the United States. The St. Paul District will continue to coordinate its planning for water resource projects with other Federal, State and local agencies which have responsibilities to deal with water resources, pollution control and water quality problems, in order that the greatest benefits possible can be obtained from these developments.

Thank you.

MR. STEIN: Thank you, Colonel Harding.

Are there any comments or questions?

MR. MC DERMOTT: Mr. Chairman?

MR. STEIN: Mr. McDermott.

MR. MC DERMOTT: I have several questions I would like to ask the Colonel.

Colonel, I believe you referred in your little discussion here to an 1899 Federal Act that covers certain kinds of pollution, the dumping, for instance, of refuse into a navigable stream.

COLONEL HARDING: That is correct.

MR. MC DERMOTT: Isn't it true that if the Corps of Engineers, Colonel, requests the Department of Justice to prosecute a violation or an alleged violation of that particular Federal statute, that it is absolutely necessary for the Department of Justice then to prosecute that alleged violation, whether or not it deems it advisable? Is that correct?

COLONEL HARDING: Well, I am not sure of what the responsibilities of the Department of Justice entail. I know that the Act is one in which -- I have forgotten the legal term which pertains to it -- but there is no legitimate excuse accepted for causing of pollution, and, well, I think the Department of Justice probably makes the determination based on the evidence which we produce as to whether they have a case. I think that is how the thing works out.

MR. MC DERMOTT: I would like to read into the record now -- and I am simply asking the Colonel these questions for purposes of clarification, and I think this is a question that should be of interest to all the members of this audience and to all the persons in the two States of Wisconsin and Minnesota concerned with pollution of the Mississippi River, or alleged pollution of it -- I want to read into the record a portion of Section 413 of Title 33 of the U.S. Code Annotated.

Before I do so, I want to say that Section 407 is referred to in this portion that I am going to read, and I believe, if I am not mistaken, Colonel, that 33 U.S.C.A. 407 is the statute that you have been talking about as the 1899 Act relating to pollution of navigable waters?

COLONEL HARDING: That is correct.

MR. MC DERMOTT: I am reading from 413, and it reads in part as follows:

> "The Department of Justice shall conduct the legal proceedings necessary to enforce the provisions of Sections" --

and then it goes on to enumerate a number of them. I will just read this one, 407 of this Title:

> "... and it shall be the duty of the United States Attorneys to vigorously prosecute all offenders against the same whenever requested to do so by the Secretary of the Army, or by any of the officials hereinafter designated, and it shall furthermore be the duty of said United States Attorney to report to the Attorney General of the United States the action taken by him against offenders so reported."

That concludes it. There is omitted language after that in the statute.

Bearing in mind the language that I have just read aloud, Colonel, wouldn't you say that this language makes it pretty clear that if the Corps of Engineers requests a prosecution of an alleged violation of Section 407, there isn't any discretion vested in the United States Attorney to decline to prosecute or to prosecute, but he simply must prosecute. Isn't that correct?

COLONEL HARDING: I believe it is correct according to the law as read, but it would appear to me that the United States Attorney still has to make the determination whether he has what he considers sufficient evidence to prosecute.

I am a little bit out of my responsibility, speaking for the United States Attorneys.

MR. MC DERMOTT: Well, for the record then, and I don't want to be in a position of arguing with the Colonel, but I would like to get this into the record too, Mr. Chairman -- I would like to cite the fact that there is a decision of a Federal court. It is the State of South Carolina ex rel Maybank vs. South Carolina Electric and Gas Company. This is the District Court of South Carolina, 41 Federal Supplement 111, and this case clearly holds that where a 407 violation or alleged violation is referred to a United States Attorney with a request for prosecution thereof, he has no discretion and must prosecute.

Now, just one more question here, Colonel: Bearing in mind this statute or these statutes that I have been talking about, and your own statement about 31 investigations having been made since 1957 of alleged pollutions of the Mississippi, and your further statement that there were two cases last spring that I think you said were referred to the Department of Justice, what two cases were these, Colonel?

COLONEL HARDING: Well, to be specific, the two cases which in effect resulted in this meeting were the two oil pollutions, the soybean oil and the petroleum oil case.

MR. MC DERMOTT: Can you tell me, sir, approximately when those investigations were referred to the Department of Justice?

COLONEL HARDING: I believe that they were referred by our office back in June. I think it was June of last year.

MR. MC DERMOTT: June of 1963?

COLONEL HARDING: That's right.

MR. MC DERMOTT: And were they referred with a mere recommendation, or a mere statement of the facts involved, as you saw them, or were they referred to the Department of Justice with a request to prosecute?

COLONEL HARDING: They were referred by the St. Paul District through our channels to the Chief of Engineers' office in Washington, and we gave them all the facts that we had available on the case. As I remember, we recommended that they be prosecuted. That is correct.

MR. MC DERMOTT: You recommended that they be prosecuted?

COLONEL HARDING: That is correct.

MR. MC DERMOTT: I see. Did you -- and I don't want to seem to be splitting hairs, but the language used by the statute here is "request" -- did you actually request that they be prosecuted?

COLONEL HARDING: I don't remember the exact terminology. Perhaps Mr. Hauser can answer that. He is Chief of the Operations Division at the St. Paul Engineers District, and he was intimately concerned with these pollution cases last spring, as many of you are well aware. Go ahead.

MR. L. A. HAUSER: In our particular case, what we can do is recommend to our higher authority the action that should be taken. The final action directing prosecution must be taken by the Office of the Chief of Engineers or the Secretary of the Army.

MR. MC DERMOTT: I see. Do you know in this instance, with reference to these matters, did your higher office request the Department of Justice to prosecute?

MR. HAUSER: It is my recollection that they requested that prosecution be started.

MR. MC DERMOTT: I see. Do you have any fixed policy on this matter, or does your higher office have any fixed policy on this matter? In other words, if you submit to them a statement of facts regarding an alleged or reputed violation of Section 407 here, an alleged pollution of the Mississippi -- let's take that one -- do you know if they have a fixed policy?

Would they simply take the facts as you give them, look them over and, if you recommend prosecution, will your higher office turn around and say to the Department of Justice, "We request prosecution"?

MR. HAUSER: I am sure they will.

MR. MC DERMOTT: They will?

MR. HAUSER: I am sure they will, but the commission of the act is the determination, not the alleged commission of it.

MR. MC DERMOTT: All right. Yes.

MR. HAUSER: The commission of the act.

MR. MC DERMOTT: Then in this particular --

MR. HAUSER: You may or may not intend this to happen, but the fact that you did, the fact that this pollution did enter the stream, the actual commission is the violation of the Act.

MR. MC DERMOTT: Yes, whether it was intentional or not.

MR. HAUSER: Correct.

MR. MC DERMOTT: That's right. All right. Now, just one further question here: With reference to these two instances of oil spillage that perhaps brought about this meeting, do you know what the reaction of the Department of Justice was to the request to prosecute those? They were submitted.

COLONEL HARDING: They referred the cases to the local United States Attorney.

MR. MC DERMOTT: This takes us to the local United States Attorney. I believe it is Mr. Miles Lord, is it not?

COLONEL HARDING: That is correct.

MR. MC DERMOTT: Has Mr. Lord indicated his intention with reference to these oil spillages? Is he going to prosecute, or isn't he?

COLONEL HARDING: He hasn't indicated what he is going to do to me.

MR. MC DERMOTT: All right. No further questions.

MR. STEIN: I think it should be pointed out, in all fairness, that, as I understood the statute as read by Mr. McDermott, it says the Secretary of the Army has to request it. There has been no indication before this group that the Secretary of the Army has requested it.

MR. MC DERMOTT: Well, I took the statement made by the gentleman out here in the audience as to the general policy, and I think he said it was true as to these specific instances that we are talking about, that there was a request actually made.

MR. STEIN: No. If I recall, he said he believed it.

If we are going to deal with a request, I think this is a simple letter written, and we should have the letter. If we don't have the letter, I don't know that anyone here says that the Secretary of the Army made that request.

MR. HAUSER: I believe the question was whether it was a request or whether the Secretary of the Army or Chief of Engineers requested or directed. I think that was the way you phrased the question.

MR. MC DERMOTT: Yes.

MR. HAUSER: And it was my recollection, and I don't have the letter here to verify that, that he requested it.

MR. MC DERMOTT: That's what I wanted.

MR. HAUSER: Requested action.

COLONEL HARDING: I am not sure whether he requested or recommended.

MR. STEIN: That may be a recollection. I think, in a matter like this, we have to see the words of the letter.

MR. HAUSER: This we would have to check, of course.

MR. STEIN: Of course.

MR. HAUSER: But I do know that the matter has been referred to the United States Attorney, and I know that the United States Attorney has been in contact with the violator.

MR. STEIN: Mr. Muegge?

MR. MUEGGE: Mr. Chairman, could we not have the letter that was transmitted to the local United States Attorney entered as part of the record?

COLONEL HARDING: We wouldn't have that letter.

MR. STEIN: I don't know where to get the letter. Now, if the Army Engineers would make the letter available --

COLONEL HARDING: We wouldn't have that letter. The only letter we would have would be our recommendation back to the Office of the Chief of Engineers in Washington, and the Office of the Chief of Engineers then would write his own letter over to the Department of Justice.

MR. STEIN: Then it seems to me that it is abundantly clear that this recollection of a letter that they couldn't possibly have seen is just a recollection. We would be glad to consider that if we had the letter.

MR. MC DERMOTT: Certainly you are not implying, Mr. Chairman, are you, that the Secretary of the Army would have any desire to conceal the contents of that letter, or to keep it from the public? Are you?

MR. STEIN: Desire? He certainly would be delighted to have it seen. As a matter of fact, you seem to have a remarkable familiarity with it, which belies his reluctance to make it public.

(Laughter.)

MR. MC DERMOTT: I am sorry. I might guess at its contents, but I have never seen the letter, and I have never seen a copy of it.

MR. STEIN: Neither have I, but I am just saying, for us to consider it--I know how these letters often go from the head of a Department, or the Secretary of the Army, and I think before we make conclusions, or at least speaking for myself, before I would like to make a conclusion of what the Attorney General or the Justice Department had to do on the basis of a letter from the Secretary of the Army, I think we should see the exact wording of the letter so we can make that determination.

I don't see any problem in getting this letter. If the Army Engineers can't get it, we will be delighted to get that in Washington and make it part of the record.

How would you like that, Colonel? Would you want us to get it, or you?

COLONEL HARDING: It is immaterial, depending upon which you prefer to do, Mr. Chairman. We could probably call Washington and get it in a few days, or you could pick it up in Washington from the Chief's office.

MR. STEIN: Surely. There is no problem.

MR. HAUSER: I could, in the meantime, attempt to verify whether or not we have the exact wording of it. Whether we have or not, I will try to get that in a very short period.

MR. MUEGGE: Mr. Chairman, could you ask him to make a report tomorrow morning on that?

MR. HAUSER: I will probably be able to give that to you this afternoon. We either have or we haven't. That is the point.

MR. MUEGGE: Mr. Chairman, I have a question.

Colonel Harding, do you know whether there are any memorandums of agreement between the Corps of Engineers or the Secretary of the Army with the Department of Health, Education, and Welfare, relating to pollution control?

COLONEL HARDING: Well, there is, of course, the Water Pollution Control Act Amendment of 1961, which requires that when we make a determination as to our storage requirements in our reservoirs for water quality control, that this has to be reviewed by the Secretary of Health, Education, and Welfare, and, quite frequently, during our studies, particularly when we are on a basin-wide basis, we have the Public Health Service of the Department of Health, Education, and Welfare, make the study for us, and we include that as part of our record.

As to your question as to specific agreements, I don't know of any, but I am sure there are, and I know that we work closely with the Department in all of our projects where water quality control is an element.

MR. MUEGGE: Do you in any way think that the Corps is duplicating efforts of the Department of Health, Education, and Welfare?

COLONEL HARDING: No. I think it is safe to say that we are not.

In fact, as I have already mentioned, normally we ask them to make the study for us in the area in which they are the experts.

MR. MUEGGE: Do you have any --

COLONEL HARDING: For example, we have been doing a lot of work, study work, survey work, in the river basin north, and the Department of Health, Education, and Welfare is providing us with the water quality control studies up there. Similarly, they are doing the same thing for our study on the operation of the headwaters reservoirs which I have already mentioned.

Whenever we have a water quality, or any water problem, we normally ask the Department of Health, Education, and Welfare to make a study for us, and frequently provide them the funds for it.

MR. MUEGGE: Are there any Corps installations within the region that we are considering here?

COLONEL HARDING: Well, the locks and dams up and down.

MR. MUEGGE: How about harbors for part of your construction fleet? Are any of those in the area?

COLONEL HARDING: In Fountain City. Is that below the area?

MR. MUEGGE: That is below the area.

MR. HAUSER: That is below.

MR. MUEGGE: How about your boats? What do you do for sewage disposal at those locations?

COLONEL HARDING: I will turn this over to Mr. Hauser.

MR. HAUSER: All the land installations have their own sewage disposal systems, and, insofar as the vessels that we operate are concerned -- dredges, and so forth -- presently we are in the process of developing systems on these plants; but up to this time there has not been any type of equipment that has been approved by the United States Coast Guard for such, and it is in the process of being developed.

Again, we are handicapped to some extent by the availability of funds to do this.

MR. MUEGGE: At the moment then, I assume that sewage from the boats is being discharged, and waste from the boats is being discharged into the watercourses?

MR. HAUSER: This is correct. However, when you say "wastes from the boats," I presume that you are speaking now of other than bilge pumping and that type of thing. You are speaking of human waste?

MR. MUEGGE: Garbage and bilge pumping, and anything of that nature.

MR. HAUSER: No, no. Bilge pumping, garbage, and that type of thing, is not being discharged into the river. That is taken care of by land pumping in all cases, and all garbage disposal is made on that same basis.

I am speaking now of Federally owned and operated equipment.

MR. MUEGGE: Now I would like to ask Colonel Harding or Mr. Hauser, whichever one can answer it, what is considered, aside from oil pollution, interference with navigation?

COLONEL HARDING: Well, I will start out, and then let Mr. Hauser supplement it.

I think, generally speaking, we have made a rather broad interpretation of what is injurious to navigation. Obviously, petroleum or soybean oil, if people report to us that there are dumps along the edges of the Mississippi -- for example, we received a report a couple of months ago that one of the packing plants had a dump in which it was possible that some of the material was washed down in the event of high water. We investigated that and asked them to clean up.

In response to your question, I think our interpretation has generally been rather broad. If anyone reports to us an incident which they feel warrants reporting, we make an effort to investigate it and warn the concern involved.

MR. WISNIEWSKI: Colonel Harding, you said you asked them to clean it up. Why don't you tell them to clean it up? We have to do that under our laws.

COLONEL HARDING: I think we do the same thing.

MR. HAUSER: Colonel Harding does tell them to clean it up. He asks them to clean it up, and follows up to see that they do. That has been the case in all instances.

MR. MUEGGE: Thank you, Colonel and Mr. Hauser.

MR. WISNIEWSKI: I have one question.

MR. STEIN: Mr. Wisniewski.

MR. WISNIEWSKI: Colonel Harding, in the sedimentation studies you mentioned, does the United States Geological Survey participate in those?

COLONEL HARDING: I am sure they are participating with us. In fact, I know they are.

MR. WISNIEWSKI: They have the agency.

COLONEL HARDING: Yes.

MR. WISNIEWSKI: Thank you.

MR. STEIN: Are there any further questions?

MR. SMITH: Yes.

MR. STEIN: Mr. Smith.

MR. SMITH: The United States Public Health Service reports indicate that 5 percent possibly of the barges carrying gasoline and other petroleum products may be so-called leakers. What authority or control do you exercise over these barges?

COLONEL HARDING: Well, as soon as the determination has been made that they are leaking, obviously we direct them to correct the situation.

MR. HAUSER: May I supplement that?

COLONEL HARDING: Go ahead.

MR. HAUSER: When we run across or have an awareness, first of all, of a leaky barge or something that is leaking gasoline, petroleum, or something of that nature that is dumping into the river, they are immediately advised to take this out of service, and the Coast Guard is notified immediately, because these are inspected barges, and they are taken out of service until the situation is corrected.

In most cases, I mean, these are not severe unless they get into an accident. It may be a leaky seam or something of that sort. If what you are talking about is that in 200 miles you are losing 350 gallons, or something like that, we have had cases, of course, where a gasoline barge has been split up and something in the nature of a million gallons will run down. I mean, this, of course, is an accident, and that barge, of course, is taken out of service immediately. It would almost have to be, in any event, and local action is taken to insure protection.

MR. MC DERMOTT: I have two more questions.

MR. STEIN: Yes. Go ahead, Mr. McDermott.

MR. MC DERMOTT: Just two short ones.

Colonel, does the Corps have a right to inspect, a visitorial right on these boats, barges, vessels, anything that is navigating the Mississippi? For example, can you board them? Do you have access to those vessels for inspection purposes to see what is going on in them?

MR. HAUSER: To determine if they are --

Reproduced from best available copy.

MR. MC DERMOTT: If they are a possible source of pollution.

MR. HAUSER: No, we don't. That is a function of the Coast Guard.

MR. MC DERMOTT: That is a function of the Coast Guard?

MR. HAUSER: That is correct.

We observe these, because they go through 13 locks and dams in this District, so we have access to them. If a vessel is a leaky vessel, we may, and have on occasion, refused lockage until the condition is corrected.

MR. MC DERMOTT: I see.

COLONEL HARDING: The Commander is going to speak later.

MR. MC DERMOTT: The Commander of the Coast Guard is going to talk later?

One further question: The penalty provisions that have to do with that Section 407 -- I have them here someplace in this memorandum -- provide for a fine not exceeding $2,500 nor less than $500, and for imprisonment not less than 30 days nor more than one year, both the fine and the imprisonment. Then they say, "in the discretion of the Court, one-half of said fine to be paid to the person or persons giving information leading to the conviction."

To your knowledge, do you know of any people who have ever collected under this statute on a penalty?

MR. HAUSER: Not to my knowledge.

COLONEL HARDING: Not to my knowledge within the District here. Possibly nationwide, but I know of no instances where any was collected.

MR. MC DERMOTT: I see. Thank you. That is all I have.

MR. STEIN: Are there any further questions from Minnesota?

(No response.)

MR. STEIN: Thank you.

By the way, I think we can put this into the record. As you probably know, Section 13 of the Rivers and Harbors Act of 1899 sets the old type of statute of giving rewards for information. I think that practice generally has fallen into disuse.

MR. MC DERMOTT: Not with Internal Revenue it hasn't.

(Laughter.)

MR. STEIN: I understand the public relations staff of Internal Revenue has the best public relations of anyone.

Reproduced from best available copy.

I doubt that much money is paid for information, certainly not in this field. To my knowledge, in the United States, no rewards have been paid to private individuals for information.

MR. MC DERMOTT: I see.

MR. POSTON: We next have the Bureau of Public Roads, represented by Mr. R. H. Paddock. Is Mr. Paddock here?

MR. RADEMACHER: No. He had to leave.

MR. POSTON: We have here a statement by Mr. Paddock, who is Division Engineer for Wisconsin of the United States Department of Commerce, Bureau of Public Roads. He asked that this be included in the record.

MR. STEIN: Without objection, this will be included in the record as if read.

MR. WISNIEWSKI: How will we know what is in it?

MR. MC DERMOTT: Will we get copies?

MR. STEIN: Do we have facilities for duplicating, or, if you wish, we can have this read now.

MR. WISNIEWSKI: I think it should be read.

MR. STEIN: All right. Would you read this?

MR. POSTON: Do you want to read it, Mr. Rademacher?

MR. RADEMACHER: This is a statement from the United States Department of Commerce, Bureau of Public Roads, as submitted by Mr. Robert H. Paddock, Division Engineer for Wisconsin, February 7, 1964. The statement reads as follows:

STATEMENT OF ROBERT H. PADDOCK, DIVISION ENGINEER FOR WISCONSIN, BUREAU OF PUBLIC ROADS, DEPARTMENT OF COMMERCE, PRESENTED BY J. M. RADEMACHER

The Bureau of Public Roads of the U. S. Department of Commerce appreciates the opportunity of presenting to this conference its interest in the control and prevention of pollution of the Upper Mississippi River. Our interest relates specifically to the Great River Road which has been mentioned earlier in this conference.

The Great River Road was conceived originally by the Mississippi River Parkway Planning Commission (now the Mississippi River Parkway Commission) as a national parkway to be developed in the pattern of the Blue Ridge Parkway (North Carolina and Virginia) and the Natchez Trace Parkway (Alabama, Mississippi and Tennessee).

The Congress of the United States in the Act of August 24, 1949 (Public Law 262, 81st Congress) instructed the Bureau of Public Roads, Department of Commerce, and the National Park Service, Department of the Interior, to survey and study the possibility of developing a national parkway generally following the course of the Mississippi River. The study was made and its findings were presented to the Congress in a joint report by the Secretary of Commerce and the Secretary of the Interior, entitled Parkway for the Mississippi, dated November 28, 1951.

The joint report disclosed the inadvisability of developing a national parkway on an entirely new location along the Mississippi River for a number of reasons: costs of required parkway lands and construction would be prohibitive; there would be a duplication of existing highways presently or potentially adequate for traffic purposes; preferred scenic locations already had been preempted by railroads, existing highways, commercial and industrial development, and cities; and Federal maintenance, administration and operation across the ten States would be difficult.

The joint report recommended, instead, that a plan for a scenic route should be developed by the States and administered by the various State highway departments. This could be accomplished by improving suitable existing highways to parkway-like standards and incorporating them into a continuous route by interconnecting them where necessary with sections of new construction. Because many of the existing highways already are included in the several

Federal-aid highway systems, improvements to them could be made through usual Federal assistance procedures.

Among the recommended characteristics of such a highway were the following:

1. Ownership and control by the individual States.
2. Design and construction by the States with Federal advisory service furnished when requested.
3. Federal assistance in financing through the usual Federal-aid channels plus additional Federal-aid to provide parkway-like features.
4. Partial or complete control of access.
5. An adequate scenic corridor protected by land control of the adjacent roadside through the acquisition of wider rights-of-way and the use of scenic easements.
6. Adequate interpretive and public-use facilities to portray the scenic, recreational, historical, cultural, geographic, and other resources along the route.

The Federal-Aid Highway Act of May 6, 1954, authorized the Bureau of Public Roads to expend $250,000 from its administrative funds "... for the purpose of expediting the Interstate planning and coordination of a continuous Great River Road and appurtenances thereto traversing the Mississippi Valley from Canada to the Gulf of Mexico ...". Under this Act, the Commissioner of Public Roads made available to the ten Mississippi River States the services of a highway engineer with extensive parkway and general highway experience, and, through cooperation with the National Park Service, the services of a landscape architect experienced in the problems of land planning and development for scenic, recreational and other parkway uses.

Under these provisions a preliminary report was made for each of the ten States -- for Minnesota in 1956 and for Wisconsin shortly afterwards.

About a year ago a detailed report was prepared for two legs of that route in Minnesota -- extending from St. Cloud northerly to the Canadian boundary.

A detailed report for the Wisconsin route has just been completed within the past month. It is expected that a similar detailed report for the Minnesota section from St. Cloud to the Iowa State line will be accomplished this year. Both States have already accomplished the special marking and signing of their respective portions of this Great River Road -- both along the routes and on their State highway maps.

We are fortunate in these North Central States in having before us plans for the development of the Great

River Road of a roadway on both sides of the Great River in Minnesota, Iowa and Wisconsin. Thus we would eventually have, as somebody has said, a high type highway with the widest median in the world -- the Mississippi River.

Today we are particularly concerned with the Mississippi River between the Rum River and the south end of Lake Pepin, and with the Great River Road in Wisconsin for approximately sixty-five miles, from Prescott where the St. Croix River joins the Mississippi, to Nelson where the Chippewa River joins the Mississippi, and in Minnesota from south of Anoka, around Minneapolis to the west and south and thence southwesterly around Hastings, Red Wing and Lake City to Wabasha for a distance of almost one hundred miles.

Because of the development of the Twin Cities and the cities to the south, the proposed location in Minnesota diverges from the Mississippi over much of this distance except for the last fifteen miles or so from Frontenac to Wabasha.

There is already significant riverside development in this latter section and it can be expected that the detailed report will provide recommendations for further development of this section as well as of that north to Anoka, compatible with the overall plans for the Great River Road project objectives.

R. H. Paddock

The section in Wisconsin has already been accorded considerable private as well as government development and further improvement is planned from Bay City at the junction of U. S. 63 southerly to Nelson.

The most recently approved plan provides for the improvement, on new location, along the north bank of the river, of the Great River Road from Bay City northerly to Prescott.

In the existing section we already have some developed waysides or overlooks, and it can be expected that in the new section from Bay City to Prescott additional facilities of this or a higher type will be provided.

The recent report on this portion of the Wisconsin section of the Great River Road takes into account a proposed Morgan Coulee State Park about nine miles south of Prescott.

Between Bay City and Pepin there now exist well-developed wayside areas with water facilities -- on the river side of the highway together with other parking and/or picnicking areas. Additional facilities of this type have been recommended in this section and the acquisition of land for a Maiden Rock State Park with complete picnicking facilities is proposed. In addition it has been recommended that the present public use area at Fort St. Antoine be enlarged. These are some of the developments that can be anticipated on only this short section of the road.

Traffic on the section of this road from Nelson to Bay City is now in the neighborhood of 1,000 vehicles per day on an annual basis, with much greater volumes during seasonal peaks. Normal increases would indicate a doubling of this average as well as seasonal peak traffic well before the year 2000.

The development of additional sections of the Great River Road, the public promotion of the availability of such facilities and the continuing increase of tourism which is so vital to this part of the Middle West, cannot help but result in a very much greater rate of increase in this traffic than has been suggested above.

Many of the features of this development will be accomplished through the sole or joint efforts of State, local and Federal agencies. These include such items as scenic easements, control of access, relocation of utilities, recreational facilities for camping, boating and picnicking and some measure of tourist accommodations. We must also look to private enterprise for further development of some of these items, particularly in the field of tourist accommodations.

The States of Minnesota and Wisconsin as well as the Federal Government have sizable financial investment in highway facilities in this area and additional investments are anticipated in the future. It would appear essential that these investments, present and future, be protected with regard to one of the objectives for which they are made -- a recognition of the scenic, recreational and economic values of the Mississippi River itself.

To provide satisfactory services for the type and volume of traffic indicated previously, it can be expected that additional facilities will be required. Furthermore, to assure the highest and best use of the existing facilities, as well as those additional ones which will be required, the absolutely vital water supply which is essential to those facilities, as well as the relative cleanliness of the Mississippi River itself, must be maintained at the highest possible quality.

It is for these reasons that the Bureau of Public Roads, working cooperatively with the respective State highway departments, believes that the aims and objectives of this conference are inexorably linked with the optimum use of the highway facilities which we are charged with providing. We appreciate the opportunity to present our views on the subject to this conference and will do whatever we can to assist in the accomplishment of the objectives of the conference.

Reproduced from best available copy.

MR. STEIN: Thank you, Mr. Rademacher.

Are there any comments or questions?

(No response.)

MR. STEIN: As I understand it, you are going to have a one-way highway on each side of the river?

MR. RADEMACHER: Two-way highway.

MR. STEIN: On each side?

MR. RADEMACHER: A two-way highway on each side of the river.

MR. MUEGGE: It switches back and forth, doesn't it, from Minnesota to Wisconsin, from Iowa to Wisconsin?

MR. RADEMACHER: This road was built on both sides of the river.

MR. STEIN: I don't know that this has much relation to the conference, but what does that remark mean in there when it says you will have the widest median? Does that mean it will be one way on one side and one way on the other?

MR. RADEMACHER: This may be true. I don't know. I can't answer that.

MR. MUEGGE: Mr. Stein, maybe Mr. Jordahl can give us the information on that.

MR. JORDAHL: I have a certain expertise on that. The Great River Road has been designated as existing on both sides of the river in Wisconsin and in Minnesota, and it will consist of two-way traffic on both sides.

MR. STEIN: On both sides?

MR. JORDAHL: On both sides.

MR. STEIN: Thank you. I wondered about that.

Mr. Poston?

MR. POSTON: The Federal Power Commission is represented by Mr. J. J. Abramson.

Mr. Abramson.

STATEMENT OF JOHN J. ABRAMSON, CIVIL ENGINEER, CHICAGO REGIONAL OFFICE OF THE FEDERAL POWER COMMISSION

MR. ABRAMSON: I am John J. Abramson. I am a civil engineer for the Chicago Regional Office of the Federal Power Commission.

Mr. Chairman, gentlemen: I am pleased to be here in St. Paul on behalf of the Chicago Regional Office of the Federal Power Commission to participate in this conference on water quality problems in the Upper Mississippi River Basin. I say on behalf of the Chicago Regional Office of the Federal Power Commission because the comments I am about to make represent the views of that office, and are not necessarily those of our five-man Commission.

This reach of the Mississippi River and its major tributaries is of interest to us because of some 30 hydroelectric projects representing almost 83,000 kilowatts of installed capacity. Of these projects, only those main stream projects here in St. Paul are under license to the Federal Power Commission. Application for license has been filed for other projects and it is expected that applications for the remaining projects will come in gradually within the next one and a half to two years.

We have received reports of potential water pollution in some of the tributaries in this basin. On other rivers where there are paper mills upstream from our hydroelectric projects we are often made aware of their presence in the powerhouse forebays. Although unsightly, this material does no particular harm insofar as power operations are concerned. However, it has been alleged, in some instances, that certain paper mill effluents do attack turbine runners causing a rapid deterioration of the blades. This partially explains our interest in pollution control.

As many of you know, the Commission has long made its practice to notify Governors and State and local agencies of applications for preliminary permits and licenses for hydroelectric projects, and has given them an opportunity to submit comments. Furthermore, before acting on an application, the Commission requests the Secretaries of the Army, Agriculture, and the Interior to comment on the project as it affects their interests, and, if other Federal Departments or agencies are involved, they likewise are requested to submit their views.

These actions are taken because the Federal Power Act requires the Commission to consult with others, and to investigate upon its own initiative as necessary, in order to assure that licensed projects will be built and operated in a manner which -- in the words of the Act -- "... will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of water-power development, and for other beneficial public uses, including recreational purposes ..." (Emphasis supplied).

The Commission has taken the view that these "other beneficial public uses" include the alleviation of stream pollution and the improvement of water quality. Arrangements have recently been made to obtain the comments of the Department of Health, Education, and Welfare on the water quality and public health aspects of proposed projects. The comments of this agency, as of those previously mentioned, are helpful to the Commission in determining whether to issue a license and in establishing appropriate conditions to licenses issued for both new and constructed projects. If the present operation of an unlicensed project -- that is, a project which requires a license, but for which the owner has not yet applied and received one -- is not making a maximum contribution to alleviating the pollution problem, in some cases the Commission may be able to assist in remedying the situation if the project is finally licensed by imposing license conditions which will require operations to be consistent with a pollution control program.

Please be assured that we have a specific and continuing interest in the possibilities for improving water quality by operational means at projects both licensed and in the process of licensing. Our door will always be open for your suggestions.

Thank you.

MR. STEIN: Thank you, Mr. Abramson.

Are there any comments or questions?

MR. MUEGGE: Mr. Chairman, I would like to ask a question.

You referred to paper mills. Are there any paper mills or pulp mills on the St. Croix, Mississippi, or Minnesota Rivers above Lake Pepin?

MR. ABRAMSON: There are some on the Mississippi, but they would be maybe a hundred miles upstream from St. Paul, which would not have a great deal of effect on the project in St. Paul.

MR. MUEGGE: Do all your power dams have fishways?

MR. ABRAMSON: No, they don't. We are only really familiar with those that are under license. We only have authority over those, and if the Conservation Department were to present us with their opinions that this would be an integral part of the project, we would consider their recommendations for fishways.

MR. MUEGGE: All right.

MR. STEIN: Are there any other comments or questions?

MR. SMITH: I have one.

MR. STEIN: Yes, Mr. Smith.

MR. SMITH: You stated that you would require, in all cases, that maximum effort be made to alleviate pollution conditions.

Now, what direction would these efforts take?

MR. ABRAMSON: We meant by that maximum effort where it would be consistent with the economical operation of the plant, and consistent with perhaps the power facilities of the project.

MR. SMITH: Who determines this consistency?

MR. ABRAMSON: I would think that that would be estimated in Washington. We would just accumulate these views, and perhaps give our opinion and present it to them, and it is left to the Washington office to decide.

MR. MUEGGE: You are referring primarily to flow regulation, aren't you?

MR. ABRAMSON: That's right. We are mainly concerned with spilling of water when it could be used for power purposes.

MR. STEIN: Are there any further comments or questions?

(No response.)

MR. STEIN: If not, thank you very much.

MR. POSTON: Commander J. C. Parker of the United States Coast Guard, Dubuque, is here today, and we would like to hear from Commander Parker at this time.

STATEMENT OF LIEUTENANT COMMANDER JOHN C. PARKER, OFFICER IN CHARGE, MARINE INSPECTION, UNITED STATES COAST GUARD, DUBUQUE, IOWA

COMMANDER PARKER: Mr. Chairman, conferees, ladies and gentlemen:

I am here as a representative of Admiral A. J. Carpenter, Commander of the Second Coast Guard District. I am Officer in Charge of Marine Inspection at Dubuque, Iowa.

I wish to explain the duties and functions of the United States Coast Guard. The Coast Guard is the principal Federal law enforcement agency on the navigable waters of the United States and on American Flag vessels wherever they may be throughout the world, and this includes the Mississippi River in this project area which we are speaking of today. In this regard we enforce three Pollution Acts, the Oil Pollution Act of 1961, Oil Pollution Act of 1924, and the Refuse Act of 1899, which is 407. We do this for the Corps of Engineers.

Now, Colonel Harding is the District Engineer for this area, and since we are the enforcement agency on the water, our jurisdiction does not go beyond the water. We enforce this Refuse Act on the Mississippi River in regard to vessels and barges.

Colonel Harding explained the Refuse Act. In another area, with regard to oil pollution, the Coast Guard inspects and certificates vessels that carry inflammable or combustible liquids in bulk, and also vessels that carry dangerous and toxic chemicals. This is done by regulation under 46 CFR, Parts 36 through 40, and Part 98 of the Cargo Vessel Regulations.

In this regard, we also examine and certificate persons to handle these various cargoes. In this regard, may I say that due to the increase of the carriage and the transportation of chemicals and poisons in bulk by barge on the Mississippi River, on the 23rd of March this year there will be a hearing in Coast Guard Headquarters in Washington, D. C. This is done by the Merchant Marine Council, a part of the Coast Guard, which develops and promulgates regulations.

Right now, we have available an agenda of this meeting that will be held, and this agenda contains the proposed rules and regulations. I would suggest that everyone who is interested in the change in regulations, or how it will affect your business of your shipping on the river, should obtain a copy of this. You can obtain it from me by writing my office in Dubuque, just United States Coast Guard in Dubuque, and ask me for the Merchant Marine Council proceedings agenda. We will send it to you free of charge. Or, you can send to Washington, D. C., if you desire, if you want to go to the top.

In the back of this book there is a blank form, and if you have any comments to make in regard to this matter, you should make these comments and submit them to the Commandant of the Coast Guard. Believe me, every comment that is received will receive very serious considerations as to what your recommendations or suggestions are regarding changes in regulations.

Also coming up in this agenda too, we now examine and certificate people for the rating of tanker-men, only tanker-men now have been defined as persons who handle liquid combustible or inflammable material, and it does not necessarily qualify them for these explosive, poisonous or toxic materials; so what we are developing in this thing now is an examination and certification for people to handle these various specific chemicals.

I might say that our part in the enforcement of pollution control here or the enforcement of the Refuse Act of 1899 is directed primarily toward small boats, harbors, and terminals.

For our enforcement, we depend upon the cooperation of everybody who uses the waterway. Let me solicit your help here in reporting any pollution in the waterway, and we will certainly take action.

What we do is, we will refer it to the United States Army Corps of Engineers, the District in which the pollution occurs, and the administrative procedure explained by Colonel Harding will ensue.

Thank you.

(The supplemental statement submitted by Commander Parker is as follows:

Mr. Chairman, Conferees and Ladies and Gentlemen:

I am here as a representative of Admiral A. J. Carpenter, Commander of the Second Coast Guard District at St. Louis, Missouri. I am LCDR John C. Parker, Officer in Charge, Marine Inspection, Dubuque, Iowa. I wish to explain the duties and functions of the U. S. Coast Guard. The Coast Guard is the principal Federal law enforcement agency on the navigable waters of the United States and on American Flag vessels wherever they may be throughout the world. As a law enforcement agency, the Coast Guard has many functions and they are divided into 10 major missions.

The first is Military Readiness. Title 14, U. S.

Code, states that the Coast Guard shall be a military service and a branch of the armed forces of the United States at all times, operating in the Treasury Department in peacetime. Title 14 also directs the Coast Guard always to be ready to function as a specialized service in the Navy in time of war. Closely allied to peacetime readiness is the training and planning of a reserve strength adequate to perform early mobilization duties.

The second is Aids to Navigation. From the beginning of the Coast Guard to the present, Aids to Navigation has developed into one of the most important of the Coast Guard's 10 major missions. Of the 31,000 total personnel, Aids to Navigation is the primary duty of 6,350 officers and men and another 9,388 officers and men spend a substantial part of their time carrying out this mission. The Coast Guard operates 7 types of Aids to Navigation. They are: Lighthouses, Lightships, Buoys, Daybeacons, Longrange Electronics Aids (LORAN), Shortrange Electronic Aids (RATAN), and Fog Signals. Their cost and complexity vary from an inexpensive river buoy costing less than $100 to a multimillion-dollar Loran Station.

The third is Oceanography. Oceanography, the scientific study of the sea, is a natural interest of the Coast Guard, which has participated regularly in oceanographic current research since 1914, particularly in the Eastern American Arctic regions.

The legislation passed in 1961 with the President's support gave the Coast Guard greater authority and responsibility in oceanographic research. Also, the Coast Guard was made a member of the interagency Committee on Oceanography (ICO), created in 1960 to coordinate the oceanographic activities of various Government agencies involved in developing a national program.

The other members of the Committee are the Departments of Defense (Navy); Commerce (Coast and Geodetic Survey); Interior (Bureau of Commercial Fisheries); Health, Education, and Welfare (Office of Education); the National Science Foundation; and the Atomic Energy Commission. The Committee also includes observers from the National Academy of Science's Committee on Oceanography and the Bureau of the Budget.

The Coast Guard will participate in the following 7 activities of a program of a National Oceanographic Data Center interagency agreement: Ocean-wide Surveys; In-shore Surveys; Ocean Waves and Swells; Ice in the Sea; Radioactivity in the Ocean; Oil Pollution of Navigable Waters (to elaborate on this) long-range plans to cope with this problem requires investigation into coastal circulation and estuarine flushing.

Enforcement of the Oil Pollution Act requires oceanographic studies to determine causes of problem areas in the solution of the problem. The last of the above 7 activities is Military Oceanography.

The fourth is Law Enforcement. Law Enforcement Agencies afloat or ashore share the built-in frustration of police work in every land and every period of history: There are always more violators than can be prevented from breaking the law out of ignorance or carelessness, and also more with criminal intent than can be caught. There are never enough men, equipment, or money to do the job they are charged with, and the regulations they must enforce are often obsolete or conflicting.

The Coast Guard is no exception, especially since law enforcement is only 1 of 10 of its major missions. Its responsibility is broad: enforcement of all Federal laws upon the navigable waters of the United States and its possessions and on the high seas. The laws enforced by the Coast Guard are under four main categories relating to: (1) Safety and law enforcement at sea or on navigable waters; (2) Harbor safety and regulations; (3) Conservation; (4) Enforcement activities in cooperation with other Federal agencies.

The Motorboat Act of 1940 (amended in 1950, 46 USC 526, and the Federal Boating Act of 1958 (46 USC 527) are designed primarily to keep the inexperienced or careless pleasure boaters from killing or maiming themselves or others. The phenomenal postwar increase of small boats in U. S. waters (estimated at 6 million in 1961) make these laws as necessary and as hard to enforce as traffic laws ashore.

The law specifies for each of three classes of boats up to 65 feet long, lights, sound-signal equipment, lifesaving equipment, fire extinguishers, ventilation, and the like. Registration is required for power boats of more than 10 horsepower, boarding for inspection is authorized, and any boat operator may be required to show identification.

The fifth mission is Search and Rescue. Disasters on land and sea can happen anywhere, any time, and seldom happen twice in just the same way. Perhaps the only effective way to deal with them is to get good men, train and equip them well, establish general criteria, and let them use their own judgment in saving lives and property when disaster strikes or threatens.

This is the essence of the Coast Guard's Search and Rescue mandate. They are instructed to: "Perform any and all acts necessary to rescue and aid persons and to protect and save property." A Senate Report says further that, "... Congress expects the Coast Guard to save lives and property whenever it can..."

Search and Rescue is the Coast Guard's primary mission. Any Coast Guard vessel or aircraft on any other mission can be diverted to help a ship or aircraft in distress.

The sixth mission is Ocean Stations. The Ocean Station Program had its inception in a pre-World War II need for meteorological and navigational aid services for transoceanic aircraft flights. Since then the program has increased and diminished according to wartime versus peacetime requirements and the austerity of budget policy. The Coast Guard now provides the equivalent of 18 vessels operating full time to support six ocean stations -- 4 in the North Atlantic and 2 in the Pacific. These vessels, while on station, perform the following functions: (a) Collect and transmit meteorological information to the Weather Bureau, en route aircraft, and vessels; (b) Maintain readiness to perform search and rescue missions; (c) Provide aircraft and vessels with aids to navigation information; (d) Relay aircraft and vessel communications; (e) Collect, collate, and transmit time-series oceanographic information; and (f) Provide a supplementary national defense capability.

The seventh mission is Merchant Marine Safety.

The Coast Guard's Merchant Marine Safety function can be divided into the following categories: (1) Inspection and regulation of vessels and equipment for physical protection of crew, passengers, and cargo; (2) Regulation of marine personnel and protection of their rights; (3) Engineering and technical supervision over safety standards; (4) Investigation and review of marine casualties and acts of incompetency or misconduct; and (5) Liaison with the maritime industry and international bodies. To carry out these broad and varied responsibilities is the duty of 510 commissioned officers, 160 warrant officers, 150 enlisted men, and 400 civilian personnel. By this function of the Coast Guard, preventive safety measures are taken to insure that vessels engaged in the carriage of inflammable and combustible liquids, toxic chemical in bulk, and heated cargoes are inspected and certificated by the Coast Guard to insure that they comply with the minimum safety requirements. In addition, personnel engaged in the handling of these products are required to be examined and certificated.

The eighth mission is Reserve Training. The Coast Guard Reserve, by its very nature, waxes and wanes with international crises. For its purpose is to provide a trained military force of officer and enlisted personnel to supplement the regular Coast Guard in time of war or national emergency. The program has always been focused on mobilization. It is administered by the Commandant under "such regulations as the Secretary of the Treasury, with the concurrence of the Secretary of the Navy, may provide (14 USC 751)."

The ninth mission is ice breaking. Though the Coast Guard's predecessors were breaking Arctic ice and helping ice-beset ships nearly 100 years ago, not until World War II did the Coast Guard get ships entirely designed for icebreaking. Four deep-draft ice-breakers, the NORTHWIND, EASTWIND, SOUTHWIND and WESTWIND, were built for polar and sub-polar use. All but the EASTWIND were lend-leased to Russia for the duration, so the combined Navy-Coast Guard wartime team got through the war with one sea-going ice-breaker and a number of smaller vessels.

Today the United States has eight sea-going icebreakers -- five operated by the Navy and three by the Coast Guard. The remaining Coast Guard icebreakers are: the MACKINAW, built in 1941 for Great Lakes duty; the STORIS, built in 1942 for sub-polar duty; 26 buoy tenders and 32 harbor tugs with built-in icebreaking features, for use in the Great Lakes and northeastern rivers and harbors.

Icebreakers can do many Jobs. They take part in search and rescue, law enforcement, aids to navigation, and many other missions, with their icebreaking ability latent until it is needed.

Title 14 of the U. S. Code gives the Coast Guard broad authority to break ice when and where it is required.

The tenth mission is Port Security. The port security program is designed to safeguard vessels, harbors, ports, and waterfront facilities in the United States and all territory and water subject to the jurisdiction of the United States, exclusive of the Panama Canal Zone, from destruction, loss, or injury from sabotage or other subversive acts, accidents, or other causes of similar nature. A necessary part of the program is to prevent introduction into the United States, through ports, of persons, articles, or other things, including weapons of mass destruction, inimical to national security. While the objectives of the program are clearly stated, the character of enforcement effort is subject to change depending on national policy and assignment of responsibilities.

All of these missions, with the exception of oceanography, are carried out within the conference zone commensurate with the needs of the area. Particularly, in the mission of law enforcement. The Coast Guard enforces the Refuse Act of 1899 which is administered by the U. S. Corps of Engineers.)

* * * *

MR. STEIN: Thank you.

Are there any questions or comments?

DR. HARGRAVES: I would like to ask several, if the Commander is through.

If we have a Minnesota law -- I am thinking particularly of marine toilets on board pleasure craft -- does this fall within your jurisdiction? Do you have anything to do with local laws?

The Forestry Service, for example, will respect the game laws of the State in which they are in. Do you do any policing in any way, or supervising of rules or regulations laid down by the State?

LIEUTENANT COMMANDER PARKER: Well, actually, under the Bonner Act, and you do have a State-numbered law as far as pleasure boating goes, we require a minimum on the navigable waters for the Coast Guard regulation -- that is, such as lights, and so forth.

DR. HARGRAVES: Yes.

LIEUTENANT COMMANDER PARKER: Now, anything in addition to that --

DR. HARGRAVES: But that is a Federal regulation.

LIEUTENANT COMMANDER PARKER: Yes. Anything in addition to that would be up to the State to include in their law.

DR. HARGRAVES: I think you had some discussion with our staff, but I would like to bring it out here, from a standpoint of marine toilets.

Our legislature passed a law about three years ago, which will apply to pleasure boats of a certain size on Lake Pepin as well as on the Mississippi, as well as inland waters.

Now, designers haven't come up with very practical marine toilets that are not going to produce this pollution hazard, and there is a new one which has been offered to us through specifications, which depends upon LP gas and incineration, and I must admit I am afraid of this because of the potential of explosions with LP gas on board craft.

Do you have regulations against this?

LIEUTENANT COMMANDER PARKER: We have a regulation that prohibits the use of LP gas on vessels that carry passengers for hire.

Now, on vessels that engage in the transportation of freight, we have regulations that permit the use of LP gas consuming devices -- stoves, refrigerators, etc. -- and this regulation requires a certain type of installation and a certain continuing inspection procedure. This is to maintain this installation in a safe operating condition.

DR. HARGRAVES: Suppose a man has a large enough craft -- what would you say, 35, 40-footer, on the river -- and takes 10 to a dozen guests out? This is not within your jurisdiction if he has such equipment?

LIEUTENANT COMMANDER PARKER: No, Doctor, this is not within our jurisdiction.

DR. HARGRAVES: Thank you.

MR. STEIN: Are there any questions from Wisconsin?

MR. MUEGGE: I would like to ask one or two.

You mentioned that you refer pollution complaints to the Corps of Engineers. What kind of pollution complaints?

MR. STEIN: Would you speak louder, please, Mr. Muegge?

MR. MUEGGE: You have indicated that you refer pollution complaints to the Corps of Engineers. What type of pollution complaints were you referring to?

LIEUTENANT COMMANDER PARKER: I am referring to any refuse that is dumped into the river. We act as an agent for the Corps of Engineers in enforcing the Refuse

Act or Federal law on navigable waters.

MR. MUEGGE: You are primarily concerned then with pollution which would interfere with navigation?

LIEUTENANT COMMANDER PARKER: That is correct.

MR. MUEGGE: How much of the water in the region that we are considering here is considered commercially navigable?

LIEUTENANT COMMANDER PARKER: The whole Mississippi River, the Minnesota River up to Mile 23, and the St. Croix River up to Taylors Falls.

MR. MUEGGE: That is just below St. Croix Falls, or at St. Croix Falls. Do you do anything to check the manner of disposal of sewage from barges and vessels, commercial barges and vessels?

LIEUTENANT COMMANDER PARKER: Actually, there is no Federal law which prohibits the dumping of raw sewage into the navigable waters, and therefore we are not enforcing any regulation on raw sewage from commercial vessels going into the Mississippi River, or any other navigable water.

MR. MUEGGE: That is all.

MR. MC DERMOTT: Commander, is it your interpretation of Section 407 that we have been referring to, the law of 1899, that this would not prohibit, for instance, disposing of garbage, throwing that overboard, or what is sometimes referred to as excrementitious material from a boat, or anything of that sort? You do not think that 407 covers it?

LIEUTENANT COMMANDER PARKER: Garbage is covered by 407.

MR. MC DERMOTT: Garbage is covered?

LIEUTENANT COMMANDER PARKER: Actually, in the practical application of this Refuse Act, we consider any refuse -- that is, bilge oil, garbage or any other debris -- that is thrown in the water by a vessel as refuse, and would be in violation of the Refuse Act.

MR. MC DERMOTT: You don't think that would include fecal matter?

LIEUTENANT COMMANDER PARKER: No, it doesn't, because --

MR. MC DERMOTT: Do you have any specific instruction from your superiors on that, or any interpretation from the Corps of Engineers, that it doesn't include that kind of matter?

LIEUTENANT COMMANDER PARKER: This is the interpretation that we have had for many years, because we are in the business of inspecting or improving plans for vessels, and at this time there is no law or regulation which requires septic tanks, or containers in vessels, to be constructed within the vessel itself to prohibit this raw sewage, or dishwater, or bathwater, and things like that, going into the river.

MR. MC DERMOTT: Without, Mr. Chairman, getting into a dispute with the Commander -- I have no desire to do so at all -- he is apparently satisfied that the interpretation of the law that he is familiar with is the correct one.

I would like to read into the record just a portion, Mr. Reporter, of Section 407, 33 USCA. I will just read this part of the statute into the record:

> "It shall not be lawful to throw, discharge or deposit, or cause, suffer or procure to be thrown, discharged or deposited, either from or out of any ship, barge, or other floating craft of any kind, or from the shore, wharf, manufacturing establishment or mill of any kind, any refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state into any navigable waters of the United States or into any tributary of any navigable water, from which the same shall float or be washed into such navigable water."

There is considerably more to the statute, but I won't read that.

LIEUTENANT COMMANDER PARKER: Let me say in reference to that, in our interpretation a sewer is such that we consider that overflow from vessels as a sewer. It has been interpreted as such in the enforcement of this Refuse Act.

MR. MC DERMOTT: In other words, Commander Parker, you permit vessels, if they have fecal matter aboard, simply to throw it over the side, and this would not be considered a violation?

LIEUTENANT COMMANDER PARKER. No, it would not be permitted.

MR. MC DERMOTT: Not over the side?

LIEUTENANT COMMANDER PARKER: Not over the side. No, indeed.

(Laughter.)

I guess we have to qualify this a little bit here. It says "in a liquid state." We require on these vessels the installation of proper sanitary facilities. As such -- this is another interpretation which, of course, I am governed by -- because of the use of these sanitary facilities it would qualify. This seems to be the intent of this Act, through interpretation I say again. I hope that clarifies it.

MR. MC DERMOTT: I see. Just one more question on this, Commander.

You say there has been an interpretation. I am curious to know, has this been an interpretation of a lawyer in the Federal Government? Is it an opinion of the Attorney General of the United States, or of counsel for the Coast Guard, or do you know, sir?

LIEUTENANT COMMANDER PARKER: This would be an interpretation of the Act through these various court cases that have occurred over the years, and in the annotated section.

Now, I haven't done any specific reference research on this. I would assume that we could, if we do a little reference research here, find the court case.

MR. MC DERMOTT: I see. You think there is some case law that supports your position?

LIEUTENANT COMMANDER PARKER: That's right. Yes.

MR. MC DERMOTT: Thank you, Commander.

MR. STEIN: By the way, in the interests of the record for the Commander, I should point out that this Act is under the jurisdiction primarily of the Corps of Engineers and the Department of the Army. The basic interpretations of the court decisions are not made by the Coast Guard. They enforce them. The Department of the Army makes the interpretation and has the initial responsibility for interpreting this Act.

MR. MUEGGE: I was going to ask one more question.

MR. STEIN: Would you speak up, Mr. Muegge, please?

MR. MUEGGE: You heard the testimony this morning in reference to leakers. Do you confirm the statement that was made that one out of every twenty oil barges is a leaker?

LIEUTENANT COMMANDER PARKER: Well, I made a mental note of that this morning when I head that five percent figure, and it seems rather large to me. However, I have no statistics to bear out my opinion.

We do have leakers in this area. This is very true. It is the duty of the Coast Guard in the inspection and certification of these barges that transit the Upper Mississippi waterway, that when there is a leaker reported or encountered by our people, what we do is we will revoke the certificate of inspection, and then the next thing that must be done is that this barge that is leaking has to be taken to a terminal where it can be pumped out.

Sometimes it is rather difficult to find empty storage space to dispose of these petroleum or chemical products, and in many cases this leaker, after the certificate is revoked, will be allowed to go to the terminal it was dispatched to go to on the onset of the voyage.

MR. MUEGGE: Even though that may be many miles from the point?

LIEUTENANT COMMANDER PARKER: That is very true, but this is more expeditious than holding it up or tying it up to the bank and just letting it leak and maybe drain out into the river, and then maybe in a few days of moving, let us say from Dubuque to St. Paul or something like that, where there is known storage, we can expedite the removal of this contaminating product in order to get this barge repaired and made seaworthy again.

MR. MUEGGE: Some time ago there was an accident down in the southern part of the Mississippi River where a barge --

MR. STEIN: Again, Mr. Muegge, the people in back can't hear you.

MR. MUEGGE: Some time ago there was a barge containing chlorine cylinders sunk in the southern part of the Mississippi. Is there any way of controlling the avoidance of such matter, or accident, in this area?

LIEUTENANT COMMANDER PARKER: This is part of the agenda that will take place in Washington on the 23rd of March, the construction of barges that contain these separate cylinders for the carriage of these poisonous gases.

This is part of our duty, to investigate the cause of all these accidents, and from this particular accident to which you refer, the cause of this accident was,this barge was an open hopper type barge that contained these cylinders of chlorine, and the barge filled with water and sank near Natchez, Mississippi. In our proposed regulations we are proposing that board work of a certain height be constructed around the hopper to prevent the ingress of water into the hull, and also the requirement of bulkheads to maintain buoyancy, should water get into this hopper and keep this barge afloat.

This is our purpose in the investigation of all marine casualties, and through this investigation we come up with the regulations to prevent further accidents, or things of that nature.

MR. MUEGGE: Thank you.

MR. WISNIEWSKI: Commander, would you think it unreasonable if we should ask the Federal Government to make available to the people along the Mississippi River, and for placement at strategic points, some of these tankers they have in mothballs, and keep them available for pickup of oil from some of these leakers, rather than having to hunt all over the river for a terminal?

LIEUTENANT COMMANDER PARKER: In this instance, I think that we might be adding to our problem, because then we would have to maintain the tankers in a seaworthy condition too, and that would involve another expense.

I don't think that the number of leakers that we have now in the Mississippi River would justify such an expenditure. This is my own personal opinion.

MR. POSTON: Commander Parker, is it difficult to apprehend or find a particular polluter or leaker boat? Is this done from a boat, from one of your boats, or do you wait until they come in to report, or just how is this accomplished?

LIEUTENANT COMMANDER PARKER: Actually, our main source of information is the Army Corps of Engineers. They have, in this Upper Mississippi River System, 27 locks in transiting this river. If there are leakers, I mean they will show up in one of these locks immediately. We are informed of this and will take immediate action, depending on, you know, where he is, and so forth.

Usually, if there is a leaker, they give us a call. We can call them by radio and tell them to stop, and we will go down and take a look at this barge and determine just how serious the situation is.

I mean, does it endanger life and property? This is a question we have to answer immediately and determine what can be done, determine if it is closer to terminals that are south, or can it be permitted to go to the north to its terminal area, wherever it may be, in the river.

MR. POSTON: I was trying particularly to bring out whether or not this is an easy matter to determine when there is leakage, or whether it might persist down a stretch of the stream and the boat be going on down through the lock and dam some distance away.

LIEUTENANT COMMANDER PARKER: Well, the average pool is about 30 miles in length, and it could not persist for any more than about 30 miles, or, well, at the onset, about six hours moving up and down this Upper Mississippi River.

MR. POSTON: I think probably I was thinking somewhat too of intermittent discharges of oil that might come from a boat. This sometimes occurs, I am informed.

Another thing that I wondered: Do you have a specific fleet or boats that just look for pollution? Is that their major job? Is there a specific appropriation or is this just one of the duties that you perform in addition to many others?

LIEUTENANT COMMANDER PARKER: This is one of the duties we perform in addition to many others.

We do have one vessel in this area, the Coast Guard Cutter Fern, and she has the duty too to observe any violations of Federal law. Should this occur, I mean, then they take action immediately.

I was going to say here we have these major catastrophes, such as collisions, and there is nothing you can do in this matter other than take whatever immediate action you can in order to prevent the danger of the discharge of these combustible or poisonous materials into the waterways. We have had a couple of them, as I think Mr. Hauser explained, down at Lock and Dam 5, where a gasoline barge broke away and went into the dam, and there were a couple of million gallons of gasoline discharged into the waterway.

Well, then the only thing you do is set up patrols to keep people from igniting this fuel until it dissipates into the river.

MR. POSTON: Thank you.

MR. STEIN: Thank you, Commander.

Are there any other comments or questions?

MR. WILSON: Mr. Chairman, I would just like to follow up Mr. Poston's question, if I may ask another question, which is certainly of interest to the authorities of both States, the conservation authorities and others from the enforcement standpoint. That is this matter of intermittent oil spills which are frequently reported, and very irritating to the public and to fishing.

What do you do about the problem of those spills? What is the problem of identifying the violator and prosecuting him?

LIEUTENANT COMMANDER PARKER: Well, this is a very difficult matter, and we are also extremely irritated by these intermittent spills. I mean, if somebody purposely -- and we know this for a fact too -- purposely will dump bilge water or oil or something else into the river. Now, they do this, you might say, at night, or where they can't be observed. This is an intentional violation of the law, and when they do it they know they are violating the law and they are not going to let anybody know about it.

Now, after it happens, I mean, you are not going to hide this thing. It doesn t go away. It increases and it becomes very obvious that somebody at some time has thrown oil or some other product into the river that is polluting the area. When we get a report of this -- this is where we depend upon the people, the fishermen, the trappers, the recreational boaters, and so forth, to report this to us as soon as possible -- then, as soon as we get this report, we send somebody up there and we take samples of this, and we try to trace it back to where it occurred. Then, just through regular police work -- I mean, tracking down people who live around the area, or anybody else who lives in the area -- we narrow it down to the possibility of who did it.

Sometimes this is impossible to find, and sometimes we are really lucky and we can make a report of a violation of the Refuse Act.

MR. MC DERMOTT: On that same point, you say this type of sporadic pollution you find irritating, Commander. You will recall that Colonel Harding, I believe, spoke of 31 investigations made of alleged or reported pollutions in the Mississippi since 1957. Were any of these 31 investigations he referred to matters, investigations in which the Coast Guard was involved, and did they involve sporadic pollution of the type you have --

LIEUTENANT COMMANDER PARKER: Not in this Upper Mississippi River, but in the Rock Island District we were involved in five cases of this sporadic nature.

MR. MC DERMOTT: Did you run down the persons ou believed to be the offenders?

LIEUTENANT COMMANDER PARKER: That is correct.

MR. MC DERMOTT: They were discovered?

LIEUTENANT COMMANDER PARKER: Not all of them were.

MR. MC DERMOTT: Not all of them?

LIEUTENANT COMMANDER PARKER: I mean, there were a couple of spills, possibly from boats, that we just were not able to run down.

MR. MC DERMOTT: I see.

LIEUTENANT COMMANDER PARKER: Now, others I would say four of them in the last two years, we were able to run down the source of pollution.

MR. MC DERMOTT: Commander, do you know if, as to those four, any prosecution was ever instituted by the appropriate United States Attorney?

LIEUTENANT COMMANDER PARKER: Well, as a matter of fact, no prosecution was recommended.

MR. MC DERMOTT: None recommended?

LIEUTENANT COMMANDER PARKER: I mean, they were warned because they were first offenders.

MR. MC DERMOTT: I see. If they had been second offenders, would it have been recommended, do you believe?

LIEUTENANT COMMANDER PARKER: That is possible. That is right. This is not within our purview.

MR. MC DERMOTT: You don't make the recommendations?

LIEUTENANT COMMANDER PARKER: That's right.

MR. MC DERMOTT: You make the investigations?

LIEUTENANT COMMANDER PARKER: We make the investigations, and this is the District Engineer's.

MR. MC DERMOTT: All right. Thank you.

DR. HARGRAVES: Could you tell me what chemicals are being shipped by barge and are most of the dangerous ones, other than the petroleum products, and, of course, I don't mean by-products and synthetics. Are they shipped by drums, barrels, this sort of thing, in the barges? Just what can we look forward to in case some of these chemicals are concerned?

LIEUTENANT COMMANDER PARKER: Well, anhydrous ammonia, and this is shipped in a pressure vessel.

DR. HARGRAVES: Bulk?

LIEUTENANT COMMANDER PARKER: Bulk.

DR. HARGRAVES: Large vessel?

LIEUTENANT COMMANDER PARKER: Large vessel. That's right. Sulfuric acid.

DR. HARGRAVES: Also bulk?

LIEUTENANT COMMANDER PARKER: Also bulk. That's right.

DR. HARGRAVES: And what would bulk mean? Compartments of 10,000 gallons, or more? That is a tank truck.

Reproduced from best available copy.

LIEUTENANT COMMANDER PARKER: It would probably be up to 30,000 gallons in one container, and then there would possibly be six containers in one hopper barge.

DR. HARGRAVES: So we are actually getting into pretty potent chemicals that are now coming up the river?

LIEUTENANT COMMANDER PARKER: That is very true, and this is why we are presently concerned that there is a definite danger in the shipment of this, should something occur. There should be some regulation in order to prevent this, and now the regulation requires that the barges that do haul these dangerous chemicals be suitably marked, so that they can be identified by the people that tow them and people on shore, so they know that there is a definite danger.

MR. WILSON: How long a stretch of the river is under your jurisdiction?

LIEUTENANT COMMANDER PARKER: From Keokuk to the head of navigation above Minneapolis.

MR. WILSON: How many patrol boats do you have for enforcement purposes in that area?

LIEUTENANT COMMANDER PARKER: Well, we have two large tenders. That is the Coast Guard Cutter Goldenrod, stationed at Keokuk, and the Coast Guard Cutter Fern at Dubuque, and then at St. Paul here we have a mobile boarding team.

Now, this is an enforcement body principally charged with the enforcement of motorboat laws. They also have a small boat.

Then we have three small boats in Dubuque, Iowa, that we use for intermittent patrolling on the Mississippi River. This is for search and rescue in overdue boats.

MR. WILSON: Are you able, with those boats, to maintain anything like that continuous patrol of the river, like the highway traffic officers do on the highways?

LIEUTENANT COMMANDER PARKER: No, sir, we are not.

MR. WILSON: You can only go out when you are called on in some particular case?

LIEUTENANT COMMANDER PARKER: That is very true.

MR. WISNIEWSKI: How big is a small boat?

LIEUTENANT COMMANDER PARKER: Well, I refer to our largest as a 36-foot patrol boat.

MR. MUEGGE: Commander, do any of the vessels haul pesticides in bulk?

LIEUTENANT COMMANDER PARKER: That is very true. They do.

MR. WISNIEWSKI: In liquid form?

LIEUTENANT COMMANDER PARKER: In liquid form.

I doubt whether any of them -- we haven't been too concerned with the transportation of particular exotic chemicals or pesticides in this Upper Mississippi River. However, on the Ohio River, this has definitely been true that they are hauling numerous pesticides and industrial chemicals.

MR. STEIN: Are there any further questions or comments?

(No response.)

MR. STEIN: If not, thank you very much.

LIEUTENANT COMMANDER PARKER: Thank you.

MR. STEIN: We will take a short recess.

(Whereupon a short recess was had.)

MR. STEIN: May we reconvene?

We expect to stop after the Federal representatives and have both States and the State people go on tomorrow. We will reconvene at nine-thirty tomorrow, and I understand the only door open tomorrow will be the south door on the Fuller Street Highway Building side. No coffee or food facilities are available. However, there will be plenty of parking space at that entrance. No one will be here except us, if you come.

I may say we had to intervene at the highest level to get the power put on for us here tomorrow. Evidently, they do close the place down.

I would like to take just one second before we go on. We have had some inquiries during the recess about what is happening.

I think in the stages of any inquiry of this kind, we painstakingly try to get all the facts, and this is the process whereby we do it. I think the questions from the States and the responses have been very, very effective in developing certain aspects of the problems.

What I would suggest is not to let this thing obscure the end results, because these problems do come on to an end result. Don't think the investigation is getting out of perspective, because you think the inquiries are directed in many, many cases to areas of information relatively obscure or unknown to the conferees. This does not mean that this may be the most important part of the pollution problem, but they have the other parts in their reports and in our report that they are relatively familiar with. I think the inquiries are being directed to the parts where the answers to this will illuminate the situation, and I think this should be kept in mind as this goes on.

Again, there was an inquiry, I think, directed to Dr. Hargraves relative to --

DR. HARGRAVES: The question was asked whether any radioactive material was shipped on the river. He seemed to be particularly interested in the toxic agents going up and down, for many reasons, and the answer is no, there is none. I think if there is any man here from Elk River or the A.E.C. who could answer or back my statement up -- anyway, it is shipped in. The spent fuel is taken back out again, and what circulating water there is used for cooling has been measured by our group with the Public Health group on regular monitoring, and the amount of radiation is less than background radiation.

MR. STEIN: Thank you, Dr. Hargraves.

Is there anyone here from Elk River who might want to make a statement?

MR. PAUL: I am here from the City of Minneapolis, and I understand that you are adjourning the meeting now?

MR. STEIN: No. We will in a few minutes.

MR. PAUL: And reconvene in the morning? I won't be able to be here in the morning, and I would like to know if I could leave the statement of the City of Minneapolis for incorporation in the record tomorrow.

MR. STEIN: Anyone who will not be able to be here, leave the statement with your State representatives and they will put it in the record for you.

MR. PAUL: Thank you.

MR. STEIN: Again, before we came out here on this case, we obviously always look at any thermonuclear installations in an area. I did check the Elk River situation out in Washington with the A.E.C. officials responsible for the national program and the installation and our own technical people. Their views coincide with Dr. Hargraves' view. In other words, there is no water pollution problem from the Elk River installation as far as can be ascertained.

Also, this has been pretty thoroughly looked into by the A.E.C., the Public Health people and our people, and we are satisfied that that is a reasonably clean operation, more than reasonably clean. As Dr. Hargraves says, what comes out is less than background.

Mr. Poston?

MR. POSTON: The Department of Agriculture Soil Conservation Service has Mr. Herbert Flueck here today, and we will hear Mr. Flueck at this time.

STATEMENT OF HERBERT A. FLUECK, STATE CONSERVATIONIST, UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, ST. PAUL, MINNESOTA

MR. FLUECK: Mr. Chairman, conferees, and ladies and gentlemen:

I appreciate having the opportunity of making a short statement here on a subject that the Department is very much interested in which is directly related to this problem. It has to do with soil erosion, runoff and sedimentation.

Sediment is the product of erosion. Soil erosion occurs in several ways -- sheet erosion, gully erosion, streambank erosion -- all contribute to the destruction of the land and intensify the problem of pollution and sedimentation in our streams, rivers and lakes. These forces will continue unless man provides protection measures.

Sediment damage directly affects every citizen, not just the land owner and operator who tills the land where the sediment comes from.

Our taxes are higher in order to pay for dredging silt from navigable channels and streams and cleaning roadside ditches. Our water bills are higher in order to cover added filtration costs necessary to obtain quality water. Cost of replacing reservoirs filled with silt is also an item.

Cost of removing sediment from roads, ditches, reservoirs, lakes, etc., range from 25-50 cents per cubic yard. Some cities, where their water supply reservoirs silt up find it cheaper to build new reservoirs than to dredge old ones. Providing new storage capacity usually costs from 10 to 30 cents a cubic yard. On the other hand, the cost of holding the soil on the land by sound soil and water conservation measures is less than 4 cents a cubic yard. In addition, there is a saving by keeping soil nutrients on the land for use by crops. For example, for each ton of top soil there is $2 of available plant nutrients.

To date the Soil Conservation Service, as an agency in the Department of Agriculture, has the responsibility to assist farmers develop soil and water conservation plans for their land. Such plans, when applied to the land by the farmers, will reduce soil erosion and materially reduce soil sediment pollution of streams. This assistance is made available through locally formed and administered soil and water conservation districts. All lands contributing water to the Upper Mississippi River Basin above Lake Pepin are in organized soil and water conservation districts except two counties (Todd and Hubbard in Minnesota). Each of the districts has developed programs that are concerned with land use and proper treatment of the lands to maintain economical family farm units and hold soil and water loss to a minimum. Land use includes determinations for agricultural croplands, woodlands, permanent pasture and recreation and wildlife. The land treatment measures, such as terraces, diversions, strip cropping, crop rotations, grassed waterways, along with tree planting and vegetative cover, are used to reduce sheet erosion and conserve water by reducing runoff. Structures are used to control gully erosion and create impoundment for flood prevention and flowage control. Many of these practices are cost-shared under the Agricultural Conservation Program.

Results of experiments at the Clarinda, Iowa, Experiment Station during 1934-1941 show that soil loss is 6.7 tons per acre per year less on terraced plots than on non-terraced. Both plots had the same crop rotation and percent of slope. These experiments also showed a sharp reduction in soil loss from contour farming compared to up and down hill farming.

In addition to the regular district programs, additional technical and financial assistance is available to local groups, on a watershed basis, under the Watershed

Protection and Flood Prevention Act, as amended (Public Law 566).

There are 23 active watersheds in the basin, above Lake Pepin, for which the local people have requested assistance under this Act. The applications include requests for assistance on flood prevention and sediment control, agricultural water management and non-agricultural water management, including recreation and fish and wildlife development.

Based on our evaluation of Cooks Valley in southeastern Minnesota, and other watersheds planned or being planned, sediment from sheet erosion can be reduced by about one-half with proper and adequate land use and treatment. This, then, can be further reduced by installing properly placed structures (flood prevention, grade stabilization and sediment control). The amount of sediment trapped by structures will be approximately 90 to 95 percent from the watershed area above the structure. A coordinated and complete soil and water conservation program which treats all of the sediment sources involved can be expected to reduce downstream rates of sediment production by 50 to 80 percent, but will be substantially less in areas of gentle slope where erosion is not particularly active. The range covers variations in soil erodibility and topography. Special consideration will need be given to control of streambank erosion.

The Soil Conservation Service, Forest Service and Economic Research Service, as agencies of the Department, are coordinating their programs and activities with the Department of the Army and the Department of Health, Education, and Welfare. This is coming into full focus in the comprehensive Basin studies like the Upper Mississippi River Basin, Red River of the North, etc. The comprehensive plan for the Upper Mississippi Basin is concerned with the use of water and related land resources.

Cooperation by all users of land and water, whether farmers, city dwellers, fishermen, hunters, or other recreational enthusiasts, is important and necessary to obtain the best overall use of our resources. Such efforts will result in reduced siltation in our streams and reservoirs and help to maintain the health and welfare of our people.

I want to make one comment that I did not relate to any residue, anything coming off a farm, after using pesticides and various chemicals.

We checked into that, of course, over a short period of time. We were not able to come up with anything valuable enough or pertinent enough to talk about it, and I think in the reports this morning you will note that it was indicated that that is an area that needs to be studied, so I want you to be mindful of the fact that we did look into it.

Thank you.

MR. STEIN: Thank you, Mr. Flueck.

Are there any comments or questions?

MR. WILSON: I would like to ask Mr. Flueck a few questions.

Mr. Flueck, your work is carried on State-wide with the cooperation of the local soil conservation districts, is it not?

MR. FLUECK: Right.

MR. WILSON: How much of the State of Minnesota is still not included in those districts?

MR. FLUECK: Upper Todd Lake and Cook Counties, principally.

I will say this: I think all of St. Louis County has not organized, but there are two soil conservation districts in St. Louis County.

MR. WILSON: Do you feel the land of the tributaries to most of the important streams and lakes in the State is now incorporated in soil conservation districts?

MR. FLUECK: Very close to that.

MR. WILSON: Now, what is your latest estimate of the percentage of farm land in the State which you now consider to be under as good erosion control as is reasonably attainable?

MR. FLUECK: Quickly, I would say 20 percent.

MR. WILSON: You mentioned the number of watershed districts in the State. How many did you say there are?

MR. FLUECK: I referred to watershed applications. I referred to watershed applications, active watersheds, actually, not necessarily applications, but 23 watershed areas have people in their organizing or moving in the direction of watershed protection works of improvement.

MR. WILSON: Those projects go on in the watershed areas systematically within a certain watershed supplementing the activities of the local soil conservation district, do they not?

MR. FLUECK: That is right. They are over and above the normal, every-day jobs that the local districts and farmers carry out on the land treatment measures farm by farm.

MR. WILSON: They are instituted where the erosion problem is particularly bad and needs special measures?

MR. FLUECK: It could be the erosion problem plus flood and water management problems. The watershed Public

Law 566 is a vehicle for them to use where it is more than one or two can handle themselves, or more.

MR. WILSON: In how many of those areas is the watershed program now in complete operation, or anything like complete operation?

MR. FLUECK: Well, I think that you recognize that back in the early days, Gilmore Creek is probably as complete as we can get it. East Willow, the pilot out of Preston, is very good. We had completed, or we are approaching completion of the tributaries in the Hawk, which is a big expanse of area out there under operations right now. It is near completion.

MR. WILSON: So how many altogether do you figure are in a state of reasonably good complete operation?

MR. FLUECK: You are talking about watersheds now?

MR. WILSON: Yes.

MR. FLUECK: Well, I would say in Minnesota, of course, the Chippewa is about four fairly large watersheds in themselves, plus East Willow, Rush Creek and Bear Valley by the way, was completed this year, and I would have Gilmore Creek, and the demonstration project in southeast Minnesota.

MR. WILSON: From your knowledge of the State as a whole, how many of those watershed projects do you think will be necessary to cover the entire State with the type of service that is needed.

MR. FLUECK: That is quite a question, Chester. I would say I believe in the conservation needs watersheds study that they came up with about 270 watersheds. Now, these are not large, but are relatively small. They are community-type watersheds that need some works of improvement relating to flood control, water management, recreation and wildlife.

MR. WILSON: Then in point of number of various needed watershed treatments that are actually receiving that treatment, we hardly have 2 percent yet. Isn't that correct?

MR. FLUECK: We have hardly scratched the surface. Yes, we have just started.

MR. WILSON: That is all.

DR. HARGRAVES: Mr. Flueck, on our new program that Secretary Freeman has been talking about -- in other words, turning many of the farms back to recreational areas to get them out of active production -- have we had any approaches yet in Minnesota? I ask that because many of these are watershed or multi-watershed projects also, with recreational lakes and small reservoirs, which now fall under our jurisdiction too in the new statute.

MR. FLUECK: You are referring to the opportunity for farmers to get assistance from the Department of Agriculture in recreation, which is now a land use?

DR. HARGRAVES: Right.

MR. FLUECK: And also for us to assist them in establishing, or in watersheds establishing water-base recreations?

DR. HARGRAVES: Do you have any requests as yet?

MR. FLUECK: Yes, we do. We have requests. Actually, on private recreation, on private income recreation, we have had quite a number of requests.

After one year, or shortly less than one year after the Food and Agriculture Act of 1962 that provided that was in effect, we had talks based on inquiries from 900 farmers and land owners in the State of Minnesota. If I can remember my figures, about 164 were interested in doing something shortly. About 48 already had.

DR. HARGRAVES: In the way of impoundments?

MR. FLUECK: Some of them were impoundments.

DR. HARGRAVES: And the rest were?

MR. FLUECK: Some were tapping sites.

DR. HARGRAVES: Thank you.

MR. WILSON: May I ask just one more question?

In your opinion, Mr. Flueck, what will it take to speed up the spreading of good erosion control practices on the 80 percent of the farm land in Minnesota that do not have those practices now, and the completion of the 267 watershed areas that we still need according to your estimate?

MR. FLUECK: Well, I will give you a partial answer. I won't give you a whole answer.

Of course, first, you realize fully well this is a matter of attitude. This is still a voluntary program, but we don't have enough technicians. We have never been able to service all the cost-sharing items that the ASCS Committee had the opportunity to contract for with their local people. We do the technical work. We have never been able to fulfill all the needs of the local districts. In very few cases, some cases we have, but very few. We do the on-site assistance, of course. Some of this work is technical, and we just don't have enough help in the every-day work.

Now, when it comes to watersheds, this is again a matter of money. We need more technicians to move these things along a little faster.

As I said, I would answer it partially. The other part, of course, is that this is voluntary. All people are not subscribing to this right this minute. It takes a little doing. It takes a little selling.

Even though I make that statement, I will say, as I said before, we can't begin to supply the needs, but to do it like you said would take more people and more money.

MR. WILSON: Where would you allot the responsibility as between the State and its counties and soil conservation districts, and the Federal Government, for supplying what it takes to make up this lag in getting soil conservation of the land?

MR. FLUECK: Well, I am one who has always felt the local government, the county, the State has a very big stake in this, and I think the Federal Government certainly is in a position to help; but I would expect that we may be arriving at a point where the addition, the strengthening of the position, may have to come largely from the counties and the State.

I want to say this: In the county commissioners, in the States, I imagine that this year they have allocated probably up to 80 or $90,000 with respect to districts for their assistance in hiring aid to supplement our people. The State has appropriated annually about $277,000. That includes, of course, 36 or $37,000 for added watershed planning help. That goes to the State Committee, and, in turn, is passed over to us. That also includes about 39

Reproduced from best available copy.

or $40,000 for State Committee operations, and it also includes about 160, if my figures are right, for direct aid to local soil conservation districts, for hiring aides, and we are about the tenth in the size of appropriations in the United States. So this has been very helpful, and, of course, the State Conservation Department has been very active in their particular field of work.

The Game and Fish Department, the Forestry Department, have cooperated and are in agreement with most districts in the State, and they are cooperating together. forestry and game and fish and wildlife, and so the State has quite a bit going for it in that regard.

MR. WILSON: Have you any estimate of the amount of State appropriation it would take to get this job done in the next twenty years, the annual appropriation, to speed it up so that you could complete it in twenty years?

MR. FLUECK: State-wide I don't, Chester. I am sorry. That would be a little hard for me to figure out right from here.

MR. WILSON: It has taken more than 25 years to reach this present state of 20 percent application, has it not?

MR. FLUECK: Yes, it has, and, of course, I think we started from scratch.

DR. HARGRAVES: Remember snowballs.

MR. FLUECK: Remember what?

DR. HARGRAVES: Snowballs.

MR. FLUECK: Yes. This has to be sold, ladies and gentlemen. I believe there is one field in the State of Minnesota that was somewhat on the contrary when we introduced it into Minnesota, but I want to say that with the Soil Conservation District, with the State Association, the State Committee, the respective agencies in the State, there is quite a push behind it, with the various agencies, some of which I mentioned, the Department of Agriculture, the FHA; and don't let me forget the Extension Service, the educational arm of this type of work, which is very important.

DR. HARGRAVES: I just wanted to clinch this, and I know that Herb Flueck will agree with me and with Chet Wilson, that this is a most important aspect of keeping siltation out of the reservoirs we build, and the siltage out of the lakes we are interested in in keeping the main streams clean, so that it is closely tied up with water pollution.

MR. STEIN: I couldn't agree with you more, Doctor.

You know we have a pollution abatement program as a result of one of these conferences on the Potomac River near Washington, and the question everyone asks is when are you going to swim in the Potomac? The answer we give is, "From a bacteriological point of view, we think you will be able to swim in there by 1966."

But why anyone would want to go in there and come out dirtier than when they went in, I don't know. Until we get some soil conservation practices, I don't know whether this will be ever desirable for swimming.

They have people building in the immediate area. The people come in with their bulldozers in their subdivisions and I don't see them practicing soil conservation.

MR. MUEGGE: I have no questions. I would just like to comment that our last legislature has defined siltation as water pollution. Any siltation resulting from the operation of gravel pits, quarries, mines, subdivision development, road development, and unreasonable erosion from land is defined as water pollution. We hope that we may exercise more control than has been exercised in the past.

We do have many areas in the western part of the State that practice soil erosion control, and anyone who flies over it will see the beautiful patterns of contour farming.

MR. STEIN: Thank you.

Mr. Poston?

MR. POSTON: I would like to ask now whether there are any other Federal agencies here that would care to make a statement at this time. I think I have included everyone, but I will ask just once more.

(No response.)

MR. POSTON: If not, Mr. Stein, this is the end of the testimony by the Federal agencies.

MR. STEIN: Thank you.

I know that a lot of you people have come here at considerable time and expense, and expected to make a statement today, but evidently we have run out of time and we are going to have to go on tomorrow, which is a relatively unusual procedure, because we rarely have things of this type on Friday.

We had a special situation here, as you can appreciate, in attempting to adjust our schedule with the schedules of the two governors, who wanted to participate, and Friday was the only day available to get this started.

I would strongly urge that anyone who has a feeling for this who can possibly stay, if you can stay, you are entirely welcome. It is the contribution of the people who come that makes these conferences what they are and provide ideas; but if you find you cannot stay, if you would give your statement to your respective State agencies, this will be put in the record and read into the record, and fully considered by the conferees in any determination we might make.

Are there any questions that anyone might have in the audience, before we recess?

(No response.)

MR. STEIN: If not, we will stand adjourned until 9:30 tomorrow in the same place.

(Whereupon, at 4:40 p.m., the conference was adjourned until 9:30 a.m., Saturday, February 8, 1964.)